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CONTENTS OF VOLUME 67

EDITORIALS

	Page
New quarters for the Office of Experiment Stations	1
Martha Van Rensselaer—Home economics pioneer	97
Monthly issues of *Experiment Station Record*	193
Changes in the insular experiment stations	353
The Sixth International Congress of Genetics	497
The agricultural experiment stations in 1931	641
Federal appropriations for agricultural research	643

STATION PUBLICATIONS ABSTRACTED

ALABAMA STATION:	
Bulletin 236	759
ALASKA STATIONS:	
Bulletin 10	520
Circular 3	191
ARIZONA STATION:	
Technical Bulletin 37	398
Technical Bulletin 38	370

	Page
Arkansas Station:	
Bulletin 270	368
Bulletin 271	579
Bulletin 272	547
Bulletin 273	669
California Station:	
Bulletin 522	146
Bulletin 523	616
Bulletin 524	334
Bulletin 525	246
Bulletin 526	881
Bulletin 527	563
Bulletin 528	523
Bulletin 529	531
Bulletin 530	554
Bulletin 531	611
Circular 323	898
Circular 324	584
Circular 325	611
Hilgardia, volume 6—	
No. 13, April, 1932	251
No. 14, April, 1932	260
No. 15, April, 1932	278
No. 16, April, 1932	255
No. 17, May, 1932	432
Annual Report, 1931	500, 504, 512, 516, 525, 533, 535, 559, 588, 593, 595, 605, 622, 637
Colorado Station:	
Bulletin 383	128
Bulletin 384	148
Bulletin 385	718
Bulletin 386	606
Bulletin 387	173
Bulletin 388	606
Bulletin 389	126
Press Bulletin 77	59
Connecticut State Station:	
Bulletin 333	105
Bulletin 334	381
Bulletin 335	383
Bulletin 336	590
Bulletin 337 (Report, 1931)	504, 516, 523, 535, 559, 590, 637
Connecticut Storrs Station:	
Bulletin 174	180
Bulletin 175	733
Delaware Station:	
Bulletin 175	439
Bulletin 176	571
Bulletin 177	506

FLORIDA STATION: Page
Bulletin 244 141
Bulletin 245 619
Annual Report, 1931 505, 516, 523, 535, 536, 550, 555, 559, 588, 593, 596, 606, 619, 638

GEORGIA STATION:
Circular 99 135
Circular 100 127

GEORGIA COASTAL PLAIN STATION:
Bulletin 17 381
Bulletin 18 387

HAWAII STATION:
Bulletin 64 239
Circular 4 302
Report, 1931 358, 366, 385, 444, 448, 473, 494

IDAHO STATION:
Bulletin 182 52
Bulletin 184 257
Bulletin 185 294
Bulletin 186 234
Bulletin 187 254
Bulletin 189 243
Research Bulletin 10 290
Circular 65 384
Circular 66 463
Circular 67 494

ILLINOIS STATION:
Bulletin 376 133
Bulletin 377 36
Bulletin 378 693
Bulletin 379 765
Circular 389 180
Circular 390 449
Circular 391 150
Circular 392 634
Circular 393 751
Circular 394 769
Circular 395 727
Soil Report 52 506
Soil Report 53 506

INDIANA STATION:
Bulletin 355 651
Bulletin 356 679
Bulletin 357 764
Bulletin 358 764
Bulletin 359 758
Circular 187 303
Circular 188 299
Circular 189 590

	Page
INDIANA STATION—Continued.	
Circular 190	659
Circular 191	656, 667, 678, 782
Herbert Davis Forestry Farm—	
Report of Progress, 1923–1930	16
Francisco Experiment Field—	
Report of Progress, 1917–1930	16
Huntington Experiment Field—	
Report of Progress, 1919–1930	16
Jennings County Experiment Field—	
Report of Progress, 1921–1930	16
Pinney-Purdue Experiment Field—	
Report of Progress, 1920–1930	16
Purdue-Vincennes Farm—	
Report of Progress, 1925–1930	16
Sand Experiment Field—	
Report of Progress, 1924–1930	16
Scottsburg Experiment Field—	
Report of Progress, 1906–1930	16
Soils and Crops Experiment Farm—	
Report of Progress, 1915–1930	16
Worthington Experiment Field—	
Report of Progress, 1913–1930	16
Forty-fourth Annual Report, 1931	500, 505, 516, 523, 533, 539, 560, 588, 593, 596, 605, 612, 620, 631, 637, 638
IOWA STATION:	
Bulletin 286	306
Bulletin 287	209
Bulletin 288	685
Bulletin 289	760
Bulletin 289a	761
Bulletin 290	724
Bulletin 290a	724
Research Bulletin 145	308
Research Bulletin 146	308
Research Bulletin 147	106
Research Bulletin 148	113
Research Bulletin 149	143
Research Bulletin 150	178
Research Bulletin 151	720
Circular 133	180
Circular 134	150
Circular 135	765
Circular 136	763
Circular 137	704
Leaflet 29	725
Annual Report, 1931	356, 366, 373, 377, 385, 398, 399, 424, 444, 447, 450, 462, 470, 473, 492, 493, 494
KANSAS STATION:	
Bulletin 256	333
Technical Bulletin 30	240
Technical Bulletin 31	290
Circular 163	239

	Page
Kentucky Station:	
Bulletin 324	141
Louisiana Stations:	
Bulletin 227	732
Bulletin 228	727
Fruit and Truck Station Report, 1931	130, 148, 191
North Louisiana Station Report, 1931	123, 136, 181, 191
Northeast Louisiana Station Biennial Report, 1930–31	28
Rice Station Biennial Report, 1930–31	239, 268, 301, 322, 332, 350
[Biennial] Report, 1930–31	222, 233, 244, 263, 283, 294, 303, 313, 322, 341, 345, 350
Maine Station:	
Bulletin 359	617
Official Inspections 142	673, 674
Maryland Station:	
Bulletin 331	742
Bulletin 332	732
Bulletin 333	672
Forty-fourth Annual Report, 1931	506, 517, 523, 592, 594, 613, 638
Massachusetts Station:	
Bulletin 280 (Annual Report, 1931)	367, 378, 385, 399, 420, 424, 428, 446, 447, 457, 462, 471, 473, 477, 494
Bulletin 281	665
Control Series Bulletin 61	114
Control Series Bulletin 62	522
Meteorological Series Bulletins 519–520, March–April, 1932	210, 238
Meteorological Series Bulletins 521–522, May–June, 1932	654
Michigan Station:	
Special Bulletins 218–219	144
Special Bulletin 220	526
Special Bulletin 221	434
Special Bulletin 222	533
Technical Bulletin 121	620
Technical Bulletin 122	170
Technical Bulletin 123	166
Quarterly Bulletin, volume 14—	
No. 3, February, 1932	5, 10, 31, 32, 23, 34, 37, 39, 45, 46, 53, 54, 55, 57, 60, 64, 66, 71, 75, 84
No. 4, May, 1932	359, 384, 392, 398, 433, 438, 446, 448, 449, 459, 461, 463, 471, 494
Circular 139	143
Circular 140	190
Circular 141	566
Circular 142	542
Circular 143	611
Minnesota Station:	
Bulletin 280	76
Bulletin 281	39
Bulletin 282	757
Bulletin 283	758
Bulletin 284	758

MINNESOTA STATION—Continued. Page
Bulletin 285 687
Bulletin 286 730
Technical Bulletin 80 574
Technical Bulletin 81 617

MISSISSIPPI STATION:
Bulletin 296 28
Bulletin 297 29, 35, 94
Bulletin 298 761
Technical Bulletin 19 147

MISSOURI STATION:
Bulletin 307 251
Bulletin 308 223
Bulletin 309 301
Bulletin 310 (Annual Report, 1931) 367, 372, 376, 377, 378, 386, 409, 424, 445, 447, 457, 462, 470, 472, 473, 474, 480, 493, 494
Bulletin 311 619
Research Bulletin 162 216
Research Bulletin 163 225
Research Bulletin 164 304
Research Bulletin 165 334
Research Bulletin 166 586, 626
Research Bulletin 167 590
Research Bulletin 168 591

MONTANA STATION:
Bulletin 256 252
Bulletin 257 300
Bulletin 258 332
Bulletin 259 370
Bulletin 260 637
Bulletin 261 518
Circular 139 212

NEBRASKA STATION:
Bulletin 266 305
Bulletin 267 190
Bulletin 268 298
Bulletin 269 447
Bulletin 270 449
Research Bulletin 60 125
Research Bulletin 61 520
Forty-fifth Annual Report, [1931] 500, 505, 508, 517, 524, 572, 589, 594, 602, 621, 637, 638

NEVADA STATION:
Bulletin 125 300
Bulletin 126 427, 471
Bulletin 127 471
Annual Report, 1931 367, 445, 448, 462, 494

NEW HAMPSHIRE STATION:
Bulletin 260 333
Bulletin 261 86

NEW HAMPSHIRE STATION—Continued. Page

Bulletin 262 (Annual Report, 1931) 505, 516, 517, 524, 533, 536, 560, 587, 592, 595, 596, 613, 638
Bulletin 263 115
Technical Bulletin 48 429
Technical Bulletin 49 527
Technical Bulletin 50 679
Circular 38 446
Circular 39 676
Scientific Contribution 33 653
Scientific Contribution 34 653
Sicentific Contribution 35 678
Scientific Contribution 36 680

NEW JERSEY STATIONS:

Bulletin 529 751
Bulletin 530 36
Bulletin 531 49
Bulletin 532 81
Bulletin 533 19
Bulletin 534 82
Bulletin 535 35
Bulletin 536 115
Bulletin 537 127
Bulletin 538 115
Bulletin 539 449
Bulletin 540 378
Bulletin 541 370
Bulletin 542 615
Bulletin 543 729
Circular 251 685
Circulars 252–256 38
Circular 257 123
Circular 258 397
Hints to Poultrymen, volume 20—
  No. 4, January, 1932 64
  No. 5, February, 1932 74
  No. 6, March, 1932 63
  No. 7, April, 1932 612
  No. 8, May, 1932 603
  No. 9, June, 1932 612
Report, 1931 .... 505, 507, 508, 517, 524, 536, 558, 560, 587, 591, 593, 594, 602, 605, 613, 638

NEW MEXICO STATION:

Bulletin 197 76
Bulletin 198 185
Bulletin 199 155
Bulletin 200 298
Bulletin 201 380
Bulletin 202 445
Bulletin 203 730
Bulletin 204 761
Forty-second Annual Report, 1931 .... 16, 29, 35, 43, 50, 62, 76, 84, 86, 88, 94

	Page
New York Cornell Station:	
Bulletin 532	616
Bulletin 533	301
Bulletin 535	44
Bulletin 536	15
Bulletin 537	214
Bulletin 538	234, 236
Memoir 139	676
New York State Station:	
Bulletin 603	153
Bulletin 604	143
Bulletin 605	305
Bulletin 606	150
Bulletin 607	136
Bulletin 608	130
Bulletin 609	289
Bulletin 610	270
Bulletin 611	526
Bulletin 612	735
Technical Bulletin 187	441
Technical Bulletin 188	442
Technical Bulletin 189	306
Technical Bulletin 190	224
Technical Bulletin 191	306
Technical Bulletin 192	250
Technical Bulletin 193	220
Technical Bulletin 194	253
Technical Bulletin 195	674
Technical Bulletin 196	734
Circular 125	717
Circular 126	717
Circular 127	714
Circular 128	710
Circular 129	710
Circular 130	715
Circular 131	765
Circular 132	677
Circular 133	681
Circular 134	681
Circular 135	674
The Vegetables of New York, Vol. I, pt. 2: Beans, U. P. Hedrick, W. T. Tapley, G. P. Van Eseltine, and W. D. Enzie	525
North Carolina Station:	
Agronomy Information Circular 66	666
Agronomy Information Circulars 67–70	656
North Dakota Station:	
Bulletin 254	616
Bulletin 255	690
Bulletin 256 (Biennial Report 1930–1931)	656, 667, 673, 690, 695, 705, 722, 731, 739, 767, 770, 778, 782

OHIO STATION: Page
Bulletin 497 (Fiftieth Annual Report, 1931) 12, 16, 29, 35, 41, 48, 50, 58, 65, 69, 75, 80, 87, 88, 93, 94
Bulletin 498 83
Bulletin 499 132
Bulletin 500 38
Bulletin 501 494
Bimonthly Bulletin 155 239, 240, 297, 302, 303, 331, 337
Bimonthly Bulletin 156 380, 439, 448, 468, 469, 470
Bimonthly Bulletin 157 521, 556, 590, 593, 613, 622, 637
Technical Bulletin 9 680
Special Circular 37 603
Special Circular 38 517
Special Circular 39 591
Special Circular 40 533
Special Circular 41 524
[County Experiment Farms Annual Reports], 1930 30, 36, 58, 65, 79, 94
Forest News—
No. 17, April, 1932 398
No. 18, July, 1932 688

OKLAHOMA STATION:
Bulletin 202 303
Bulletin 203 368
Bulletin 204 453

[OKLAHOMA] PANHANDLE STATION:
Panhandle Bulletin 37 270, 301
Panhandle Bulletin 38 462
Panhandle Bulletin 39 380

OREGON STATION:
Bulletin 293 782
Bulletin 294 696
Bulletin 295 276
Bulletin 296 712
Bulletin 297 728, 763
Bulletin 298 681
Bulletin 299 655
Bulletin 300 680
Bulletin 301 736
Bulletin 302 750

PENNSYLVANIA STATION:
Bulletin 273 109
Bulletin 274 45
Bulletin 275 185
Bulletin 276 452
Bulletin 277 433

PUERTO RICO STATION:
Bulletin 34 (Spanish edition) 532
Report, 1931 500, 517, 525, 597, 688

PUERTO RICO DEPARTMENT OF AGRICULTURE AND COMMERCE STATION: Page
Bulletin 38 (Spanish edition) 34
Bulletin 39 (Spanish edition) 550
Circular 96 (Spanish edition) 549

RHODE ISLAND STATION:
Forty-fourth Annual Report, [1931] 214, 233, 244, 318, 332, 350

SOUTH CAROLINA STATION:
Bulletin 282 615
Bulletin 283 222

SOUTH DAKOTA STATION:
Bulletin 263 533
Bulletin 264 159
Bulletin 265 158
Bulletin 266 181
Annual Report, 1931 30, 36, 50, 58, 65, 69, 76, 79, 88, 94

TENNESSEE STATION:
Bulletin 145 551
Circular 44 129

TEXAS STATION:
Bulletin 442 111
Bulletin 443 109
Bulletin 444 333
Bulletin 445 113
Bulletin 446 396
Bulletin 447 262
Bulletin 448 168
Bulletin 449 507
Bulletin 450 615
Circular 61 509, 513, 515, 520, 531, 533, 545, 546, 555, 556, 576, 638
Circular 62 758
Circular 63 724
Forty-fourth Annual Report, 1931 657, 665, 667, 673, 690, 705, 723, 731, 739, 750, 757, 770, 771, 781, 782

UTAH STATION:
Bulletin 234 568
Circular 97 126
Circular 98 287
Circular 99 654
Circular 100 663, 676, 681, 698, 738, 781, 782
Miscellaneous Publication 8 762
Miscellaneous Publication 9 763

VIRGIN ISLANDS STATION:
Report, 1931 518, 525, 573, 638

VIRGINIA STATION:
Bulletin 282 82
Bulletin 283 61
Bulletin 284 668
Technical Bulletin 44 747

VIRGINIA TRUCK STATION: Page
Bulletin 75 150
Bulletin 76 409
Bulletin 77 671
Bulletin 78 674

WASHINGTON COLLEGE STATION:
Bulletin 261 578
Bulletin 262 610
Bulletin 263 595
Bulletin 264 699

WEST VIRGINIA STATION:
Bulletin 248 139
Bulletin 249 619
Bulletin 250 666
Bulletin 251 725
Bulletin 252 678
Circular 60 138

WISCONSIN STATION:
Bulletin 421 (Annual Report, 1931) 645, 657, 668, 674, 690, 704, 706, 723, 731, 740, 757, 767, 769, 776, 782
Bulletin 422 759
Research Bulletin 112 313
Research Bulletin 113 334

WYOMING STATION:
Bulletin 185 379
Bulletin 186 440
Bulletin 187 440
Bulletin 188 726
Bulletin 189 738
Forty-first Annual Report, 1931 12, 16, 30, 57, 59, 65, 70, 85, 94

UNITED STATES DEPARTMENT OF AGRICULTURE PUBLICATIONS ABSTRACTED

Technical Bulletin—
241. Analyses and Composition of California Lemon and Orange Oils, H. D. Poore 100
273. The Bacterial Spot Disease of the Peach and Other Stone Fruits, J. C. Dunegan 145
274. Hot Water as an Insecticide for the Japanese Beetle in Soil and Its Effect on the Roots of Nursery Plants, W. E. Fleming and F. E. Baker 56
275. The Biology and Control of the Blueberry Maggot in Washington County, Me., F. H. Lathrop and C. B. Nickels 55
276. The Fractionation of American Gum Spirits of Turpentine and Evaluation of Its Pinene Content by Optical Means, S. Palkin 9
277. The Shedding of 4-Lock and 5-Lock Bolls in Upland Cotton, R. E. Beckett and J. W. Hubbard 33
278. Relation of the Method of Watering Dairy Cows to Their Water Consumption and Milk Production, T. E. Woodward and J. B. McNulty 65

Technical Bulletin—Continued. Page

279. Correlation of Hereditary and Other Factors Affecting Growth in Guinea Pigs, O. N. Eaton — 27
280. Effect of Plant Arrangement, Equipment, and Methods of Operation in Relation to Breakage of Bottles in Milk Plants, C. E. Clement, J. B. Bain, and F. M. Grant — 67
281. Experiments with Insecticides for Codling-Moth Control, E. J. Newcomer and M. A. Yothers — 152
282. Strength-Moisture Relations for Wood, T. R. C. Wilson — 174
283. Timber Growing and Logging Practice in the Coast Redwood Region of California, S. B. Show and R. Y. Stuart — 534
284. Some Physical Properties of Starch Pastes Which Affect Their Stiffening Power on Fabrics, M. S. Furry — 349
285. Properties of Western Larch and Their Relation to Uses of the Wood, R. P. A. Johnson and M. I. Bradner — 263
286. Decay and Other Losses in Douglas Fir in Western Oregon and Washington, J. S. Boyce — 280
287. Farm-Management Problems in Shifting from Sack to Bulk Handling of Grain in the Pacific Northwest, N. W. Johnson, E. F. Landerholm, G. W. Kuhlman, and T. L. Gaston — 180
288. Farm-Mortgage Credit, D. L. Wickens — 181
289. Land Utilization in Laurel County, Ky., C. F. Clayton and W. D. Nicholls — 179
290. Investigations on Harvesting and Handling Fall and Winter Pears, W. T. Pentzer, J. R. Magness, H. C. Diehl, and M. H. Haller — 134
291. The Effect of Air Drying on the Hydrogen-ion Concentration of the Soils of the United States and Canada, E. H. Bailey — 111
292. The Inheritance of Colored Scutellums in Maize, G. F. Sprague — 515
293. Factors Affecting the Development of Loose Smut in Barley and Its Control by Dust Fungicides, R. W. Leukel — 138
294. The Biology and Morphology of the Braconid *Chelonus annulipes* Wesm., A Parasite of the European Corn Borer, A. M. Vance — 582
295. Susceptibility of Barley to Leaf Rust (*Puccinia anomala*) and to Powdery Mildew (*Erysiphe graminis hordei*), E. B. Mains and M. L. Martini — 266
296. Feeding Punctures of Mirids and Other Plant-Sucking Insects and Their Effect on Cotton, W. V. King and W. S. Cook — 288
297. Factors Affecting the Price of Rice, C. E. Campbell — 332
298. Experiments in Naval Stores Practice, L. Wyman — 535
299. Repellency to the Japanese Beetle of Extracts Made from Plants Immune to Attack, F. W. Metzger and D. H. Grant — 155
300. Susceptibility and Resistance of Berberis and Related Genera to *Puccinia graminis*, M. N. Levine and R. U. Cotter — 543
302. Cotton Improvement through Type Selection, with Special Reference to the Acala Variety, O. F. Cook — 127
303. Economic Utilization of Marginal Lands in Nicholas and Webster Counties, West Virginia, M. Peck, B. Frank, and P. A. Eke — 614
304. An Alinement-Chart Method for Preparing Forest-Tree Volume Tables, L. H. Reineke and D. Bruce — 668

Technical Bulletin—Continued. Page

307. Crested Wheatgrass as Compared with Bromegrass, Slender Wheatgrass, and other Hay and Pasture Crops for the Northern Great Plains, H. L. Westover, J. T. Sarvis, L. Moomaw, G. W. Morgan, J. C. Thysell, and M. A. Bell 518
308. Biology of Some Japanese and Chosenese Grub Parasites (Scoliidae), C. P. Clausen, T. R. Gardner, and K. Sato 582
309. The Development of Package-Bee Colonies, W. J. Nolan 581
310. The Visual Spectrophotometry of Dyes, W. C. Holmes, J. T. Scanlan, and A. R. Peterson 654
311. Adequacy and Reliability of Crop-Yield Estimates, C. F. Sarle 766
312. Response of Sweet Corn to Varying Temperatures from Time of Planting to Canning Maturity, C. A. Magoon and C. W. Culpepper 675
313. Studies on Physiologic Specialization in *Puccinia triticina*, C. O. Johnston and E. B. Mains 692

Farmers' Bulletin—

1670. Hydrocyanic Acid Gas as a Fumigant for Destroying Household Insects, E. A. Back and R. T. Cotton 428
1678. The Safe Use and Storage of Gasoline and Kerosene on the Farm 174
1681. Adjusting Corn Belt Farming to Meet Corn-Borer Conditions, K. H. Myers 180
1688. Insect Enemies of the Cotton Plant, J. W. Folsom 706
1689. Grape Districts and Varieties in the United States, G. C. Husmann 259
1690. Plowing with Moldboard Plows, W. Ashby and A. H. Glaves 755
1691. How to Control Grasshoppers in Cereal and Forage Crops, J. R. Parker, W. R. Walton, and R. L. Shotwell 151

Statistical Bulletin 37. Stumpage and Log Prices for the Calendar Year 1930, compiled by H. B. Steer 137

Circular—

200. Irrigation and Related Cultural Practices with Cotton in the Salt River Valley of Arizona, S. H. Hastings 128
201. Future Trading and the Cash-Grain Markets, G. W. Hoffman 85
202. Agronomic Work of the Big Spring, Tex., Field Station—1915–1929, F. E. Keating 30
203. Midday Meals for Preschool Children in Day Nurseries and Nursery Schools, M. E. Sweeny and C. Chatfield 184
204. An Air-Pressure Extension Brush for Applying Creosote to Gipsy Moth Egg Clusters, C. W. Collins and J. V. Schaffner, jr. 58
205. The Iron Content of Vegetables and Fruits, H. K. Stiebeling 85
206. Agricultural Investigations at the United States Field Station, Sacaton, Ariz., 1925–1930, C. J. King and H. F. Loomis 11, 28, 35, 44, 94
207. Deterioration of Christmas Holly in Transit and Storage, R. C. Wright and T. M. Whiteman 42
208. Market Classes and Grades of Yearling Beef, W. C. Davis 60
209. The Farm Real Estate Situation, 1930–31, B. R. Stauber 80
210. Field Tests of Imported Red-Clover Seed, A. J. Pieters and R. L. Morgan 127

Circular—Continued. Page
211. Verticillium Wilt (Hadromycosis) of Cotton in the San Joaquin Valley of California, F. W. Herbert and J. W. Hubbard 44
212. Bud Variation in Peaches, A. D. Shamel, C. S. Pomeroy, and F. N. Harmon 134, 680
213. Summer Fallow at Ardmore, S. Dak., O. R. Mathews and V. I. Clark 124
214. Small Plants for Pasteurizing Milk, F. M. Grant and C. E. Clement 178
215. Commercial Forcing of Lilies-of-the-Valley, T. M. Whiteman 398
216. Production of Organic Acids from Carbohydrates by Fermentation, O. E. May and H. T. Herrick 359
217. *Cronartium comptoniae*, the Sweetfern Blister Rust of Pitch Pines, P. Spaulding and J. R. Hansbrough 148
218. The Break o' Day Tomato, F. J. Pritchard and W. S. Porte 387
219. Market Diseases of Strawberries from the Southeastern States, 1926 to 1930, N. E. Stevens 146
220. The Brainerd Blackberry, G. M. Darrow and G. F. Waldo 135
221. The White-Pine Weevil, H. J. MacAloney 439
222. Bacterial Counts of Milk as Affected by Some Milk-Plant Practices, C. S. Leete and L. H. Burgwald 734
223. The Glenndale Gooseberry, G. M. Darrow and G. F. Waldo 395
224. Two Destructive Defoliators of Lodgepole Pine in the Yellowstone National Park, H. E. Burke 707

Miscellaneous Circular 81, Supplement 1, The Relations between Crop Yields and Precipitation in the Great Plains Area.—Sup. 1, Crop Rotations and Tillage Methods, E. C. Chilcott 666

Leaflet—
88. Poisoning of Livestock by Plants that Produce Hydrocyanic Acid, J. F. Couch 165
89. Controlling Stomach Worms in Sheep and Lambs, E. M. Nighbert 168
90. Rockeries, F. L. Mulford 685
91. Kudzu, a Forage Crop for the Southeast, A. J. Pieters 380

Miscellaneous Publication—
98. Market Diseases of Fruits and Vegetables: Potatoes, G. K. K. Link and G. B. Ramsey 270
117. Bibliography of Ethylene Dichloride, W. A. Gersdorff 6
120. A Digest of the Literature of Derris (Deguelia) Species Used as Insecticides, 1747–1931, R. C. Roark 150
121. Market Diseases of Fruits and Vegetables: Tomatoes, Peppers, Eggplants, G. B. Ramsey and G. K. K. Link 405
131. A Dangerous Neighbor for Wheat, Oats, Barley, and Rye, D. G. Fletcher 48
132. Rice and Its By-Products for Feeding Livestock, E. W. Sheets and A. T. Semple 59
133. Research in Farm Structures, H. Giese 177
134. Workers in Subjects Pertaining to Agriculture in State Agricultural Colleges and Experiment Stations, 1931–1932, M. A. Agnew 85

Miscellaneous Publication—Continued. Page
135. The Principal Laws Relating to the Establishment and Administration of the National Forests and to Other Forest Service Activities ... 41
136. Conservation of Fertilizer Materials from Minor Sources, C. C. Fletcher ... 19
137. The Agricultural Outlook for the Southern States, 1931–32 ... 84
138. Refrigeration in the Handling, Processing, and Storing of Milk and Milk Products, J. T. Bowen ... 178
139. Some facts about the Cotton Outlook for 1932 ... 84
140. Protein Tests for Wheat and Oil Tests for Flaxseed and Soybeans ... 84
141. A Guide to Grain-Trade Statistics, H. S. Irwin ... 618
142. Construction of Sled-Type Cornstalk Shavers, F. Irons, S. W. McBirney, and R. M. Merrill ... 177
143. American Fertilizers, P. E. Howard ... 507
144. The Agricultural Outlook for 1932 ... 181

Inventory—
103. Plant Material Introduced by the Division of Foreign Plant Introduction, Bureau of Plant Industry, April 1 to June 30, 1930 ... 24
104. Plant Material Introduced by the Division of Foreign Plant Introduction, Bureau of Plant Industry, July 1 to September 30, 1930 ... 115

Proceedings of the National Conference on Land Utilization ... 613

Crops and Markets, volume 9—
No. 3, March, 1932 ... 182
No. 4, April, 1932 ... 182
No. 5, May, 1932 ... 619
No. 6, June, 1932 ... 619
No. 7, July, 1932 ... 766

Official Record:
Volume 10, No. 42, October 17, 1931 ... 597
Volume 11, No. 9, February 27, 1932 ... 597

EXTENSION SERVICE:
Circular 173. Status of Organization and Administration of Agricultural Education among Negroes, E. H. Shinn ... 336
Boys' and Girls' 4-H Club Work in the United States: A Selected List of References, compiled by E. J. Webb ... 472
Report of the Director of the Extension Service, [1930] ... 619
Report of Extension Work in Agriculture and Home Economics in the United States, 1931 ... 619

OFFICE OF EXPERIMENT STATIONS:
Classified List of Projects in Agricultural Economics and Rural Sociology, Federal Bureaus, State Agricultural Experiment Stations, and Independent Institutions, year ended June 30, 1931, compiled by B. Youngblood ... 612
Report on the Agricultural Experiment Stations, 1931, J. T. Jardine, W. H. Beal, H. M. Steece, et al ... 782

Page

Bureau of Agricultural Economics:
Application of Color Measurement in the Grading of Agricultural Products, D. Nickerson 335

Bureau of Agricultural Engineering:
Representative Plans for Farm Houses, W. A. Foster et al 349
Foundations for Farm and Village Dwellings, G. M. Warren et al 350
Progress Report on Draft of Plows Used for Corn Borer Control, W. Ashby, I. F. Reed, and A. H. Glaves 755

Bureau of Biological Survey:
Alaska Game Commission Circular 9, Laws and Regulations Relating to Game, Land Fur-Bearing Animals, and Birds in Alaska, 1932-33 280
North American Fauna 53, Mammals of New Mexico, V. Bailey 148

Bureau of Chemistry and Soils:
[Soil Survey Reports], Series 1927—
No. 30. Soil Survey of Franklin County, Alabama, J. F. Stroud et al 505
No. 31. Soil Survey of Winnebago County, Wisconsin, A. C. Anderson et al 109
No. 32. Soil Survey of Marion County, Oregon, E. F. Torgerson and T. W. Glassey 109
No. 33. Soil Survey of the Freehold Area, New Jersey, L. L. Lee and J. E. Tine 110
No. 34. Soil Survey of the Placerville Area, California, R. E. Storie and D. F. Trussell 505
No. 35. Soil Survey of Trempealeau County, Wisconsin, M. J. Edwards et al 505
[Soil Survey Reports], Series 1928—
No. 14. Soil Survey of Person County, North Carolina, R. C. Jurney et al 13
No. 15. Soil Survey of Elbert County, Georgia, G. L. Fuller and B. H. Hendrickson 13
No. 16. Soil Survey of Cedar County, Nebraska, R. C. Roberts et al 213
No. 17. Soil Survey of Johnson County, Kansas, E. W. Knobel and R. H. Davis 213
No. 18. Soil Survey of Anne Arundel County, Maryland, S. W. Phillips et al 213
No. 19. Soil Survey of Pocahontas County, Iowa, A. M. O'Neal and R. E. Devereux 213
No. 20. Soil Survey of Beauregard Parish, Louisiana, A. C. Anderson et al 655
No. 21. Soil Survey of Vernon County, Wisconsin, M. J. Edwards et al 655
[Soil Survey Reports], Series 1929—
No. 3. Soil Survey of Stanton County, Nebraska, F. A. Hayes et al 110
No. 4. Soil Survey of Dixon County, Nebraska, A. W. Goke and L. A. Brown 110
Review of United States Patents Relating to Pest Control, volume 4, Nos. 1–12, January–December, 1931 150

FOREST SERVICE: Page
Forest Taxation Inquiry Progress Report—
16. Digest of Forest Tax Laws in the United States in Effect January 1, 1932, L. S. Murphy, P. A. Herbert, and W. E. DeVries — 615
17. Taxation of Forest Property in North Carolina, P. W. Wager and R. B. Thomson — 181

GRAIN FUTURES ADMINISTRATION:
Spot Prices, Wheat and Corn, 1879—52 years—1930 — 85

BUREAU OF PUBLIC ROADS:
Public Roads, volume 13—
No. 1, March, 1932 — 77
No. 2, April, 1932 — 463
No. 3, May, 1932 — 463
No. 4, June, 1932 — 608
No. 5, July, 1932 — 754

WEATHER BUREAU:
Monthly Weather Review—
Volume 59—
No. 11, November, 1931 — 10, 11
No. 12, December, 1931 — 10, 11
Volume 60—
No. 1, January, 1932 — 366
No. 2, February, 1932 — 366
Climatological Data—
Volume 18, Nos. 11–12, November–December, 1931 — 107
Volume 18, No. 13, 1931 — 654
Volume 19, Nos. 1–4, January–April, 1932 — 654

JOURNAL OF AGRICULTURAL RESEARCH

Volume 44—
No. 2, January 15, 1932 — 112, 117, 119, 139, 140, 142, 147
No. 3, February 1, 1932 — 227, 253, 262, 273, 295
No. 4, February 15, 1932 — 371, 373, 374, 380, 448
No. 5, March 1, 1932 — 367, 374, 375, 379, 436, 461
No. 6, March 15, 1932 — 515, 519, 525, 534, 587
No. 7, April 1, 1932 — 507, 519, 540, 570, 589
No. 8, April 15, 1932 — 520, 521, 544
No. 9, May 1, 1932 — 504, 553, 557, 589
No. 10, May 15, 1932 — 504, 543, 549, 594, 630
No. 11, June 1, 1932 — 663, 695, 778

EXPERIMENT STATION RECORD

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EDITORIAL

NEW QUARTERS FOR THE OFFICE OF EXPERIMENT STATIONS

Early in June the Washington staff of the Office of Experiment Stations, located for nearly 20 years at 220 Fourteenth Street, Southwest, was transferred to the newly completed unit of the extensible building which is being erected nearby for the Federal Department of Agriculture. The quarters assigned to the Office are on the fifth floor of this structure, mainly along its B Street front facing the administration building. About 12,000 sq. ft. of floor space are provided, exceptionally well lighted, compactly arranged, and in most respects very convenient and comfortable.

This transfer of activities is incidental to the development of the Department's elaborate building project, under which it is hoped ultimately to bring together practically under a single roof the entire Washington staff except the Weather Bureau. For many years the work of the Department has been greatly handicapped by the lack of such centralization. A short time ago about 50 buildings were being utilized, mostly small, mainly privately owned, few designed with special reference to the Department's needs, and with many units even of the same bureau widely scattered.

The first step in the rebuilding program was the completion in 1908 (E. S. R., 20, p. 507) of two laboratory wings of a proposed departmental center to replace the original building, erected in 1868. After a lapse of about 20 years, a central administration unit was constructed and occupied in 1930. This segment connected the two wings, making an imposing marble edifice of monumental design with a frontage of 750 ft. along the Mall and an average depth of about 100 ft. Shortly afterward the original building was torn down, and radical regrading of the entire Department grounds has since been in progress to bring this area into conformity with the revised scheme for the development of the Mall area.

Meanwhile plans for the extension of the building in the rear across B street, Southwest, had been abandoned in favor of the retention of the street and the acquisition of the three city blocks immediately to the south for utilization in close connection with the

North Building, but with a less costly exterior. The erection of such a building was commenced in 1930, and it is the first segment, occupying about one-fourth of the entire area and located approximately at its center, which has now been completed. Meanwhile the ground has been cleared for a second segment, mainly on the eastern front, and under a progressive system of operations the remainder of the space will be utilized in due course. A contract has been let covering the completion of the entire building in about two years' time.

The building is to be known as the South Building and is of light brick with terra cotta trim. It harmonizes in general appearance with the North Building, and is to be connected with it by a central tunnel and two bridges spanning the intervening street. It will be six stories in height throughout and of gridiron arrangement, fronting on four streets, and with five inside wings spaced at 80-ft. intervals. The approximate exterior dimensions are 1,040 by 457 ft., so that it will constitute one of the largest office buildings in the world.

Certain portions of the structure have been designed primarily for offices, while others are provided with special equipment for laboratory use. A uniform depth of rooms is provided of 20 ft., with 10-ft. corridors, while wide flexibility as to width of rooms is made possible by the extensive utilization as side walls of removable 2-in. metal partitions.

The segment now being tenanted will provide on its lower floors permanent quarters for the Department Library, now numbering over 233,000 volumes. The present assignment of the remaining space includes, in addition to the Office of Experiment Stations, the Office of Cooperative Extension Work, also on the fifth floor; other units of the Office of the Secretary; the Bureau of Home Economics, with the reservation of considerable room for a departmental cafeteria; the greater part of the Bureau of Agricultural Economics; and certain portions of the Bureaus of Animal Industry, Plant Industry, and Biological Survey. Its occupancy opens the way for additional construction, and marks a distinct stage toward the completion of a project which will provide economical as well as efficient facilities for the promotion of agriculture on a scale thus far unequalled in history.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Ipomoein, a globulin from sweet potatoes, Ipomoea batatas: Isolation of a secondary protein derived from ipomoein by enzymic action, D. B. JONES and C. E. F. GERSDORFF (*Jour. Biol. Chem.*, *93* (*1931*), *No. 1*, *pp. 119–126*).—The authors of this contribution from the Bureau of Chemistry and Soils, U. S. D. A., obtained a globulin designated ipomoein by extracting the finely pulped material with 5 per cent aqueous sodium chloride solution, filtering in the usual way, precipitating by acidification to pH 4 with acetic acid, redissolving by bringing the suspension in 5 per cent sodium chloride to a reaction neutral to litmus, and saturating with solid ammonium sulfate. The ipomoein thus precipitated retained ammonium sulfate sufficient to effect its solution in distilled water, from which solution the protein was precipitated by seven days' dialysis against distilled water. This precipitate was redissolved in 5 per cent aqueous sodium chloride with the aid of sodium hydroxide sufficient to render the mixture neutral to litmus, and the protein was coagulated from this solution at 82° C. The coagulum, thoroughly washed with boiling water and dried with alcohol and ether in the usual way, amounted to 5 g from 5 kg of the fresh material.

Ipomoein thus prepared is described as a grayish white powder containing 0.2 per cent of ash, and, on a moisture-free and ash-free basis, carbon 51.79 per cent, hydrogen 7.19, nitrogen 16.16, sulfur 2.25, amide nitrogen 8.87 per cent of the total nitrogen, cystine 2.65 per cent as determined by the Van Slyke method (E. S. R., 26, p. 22) or 1.42 per cent as determined colorimetrically, arginine 6.13, histidine 3.19, and lysine 4.9 per cent, tryptophane as determined by the method of May and Rose (E. S. R., 48, p. 312) 2.69 per cent, and tyrosine, colorimetrically determined, 7.03 per cent.

A secondary protein, having many of the properties of an albumin and shown to be derived from ipomoein by enzyme action, could be isolated from the filtrate remaining after coagulating ipomoein at 82° from its neutral 5 per cent sodium chloride solution by acidifying this filtrate to pH 4 with acetic acid and reheating to 68°, at which temperature the secondary protein coagulated if the extracted sweetpotatoes had been stored at relatively high temperatures. Extracts of fresh or of properly stored material yielded no such secordinary coagulum, however. The secondary protein was also obtained by allowing a solution of carefully purified ipomoein in sodium chloride solution to stand at from 20° to 25°. Under the last-named conditions the yield of the secondary protein reached a maximum in about two days. On reducing the acidity produced during this reaction to pH 5, a decided further increase in the quantity of the secondary protein during a further 24 hours was observed, after which the recoverable ipomoein had become reduced to about 20 per cent of that originally present.

The elementary composition, nitrogen distribution, and amino acid composition of this secondary protein are given as for the primary protein or

ipomoein. These figures are: Carbon 53.5 per cent, hydrogen 6.53, nitrogen 15.26, sulfur 1.73, amide nitrogen 8.44 per cent of the total nitrogen, cystine 2.49, arginine 4.79, histidine 2.5, lysine 4.98, tryptophane 4.78, and tyrosine 6.57 per cent.

The oxidation of cobaltous cysteine, E. C. Kendall and J. E. Holst (*Jour. Biol. Chem., 91 (1931), No. 2, pp. 435–474, figs. 11*).—This contribution from the division of chemistry, The Mayo Foundation, deals in detail with the effects of a number of oxidants on the cobaltous compound of cysteine. A "brown cobaltic cysteine complex" was formed in each case, but indigo disulfonate was found the only oxidant capable of a quantitative conversion of the cobaltous cysteine compound to the cobaltic complex.

Hydrogen peroxide and oxygen converted 77 per cent of the cobaltous cysteine into the cobaltic complex and 23 per cent to cystine. Dibromophenolindophenol converted 89 per cent into the cobaltic complex, 11 per cent of the thiol group combining with the quinone group of the dye. Cysteine and cobalt sulfate added to dibromophenolindophenol or to ferricyanide resulted in the oxidation of two-thirds of the thiol group to the cobaltic cysteine complex.

Among numerous other observations recorded was that of a slow increase, continuing for many hours, in the reduction potential of the cobaltous cysteine compound. The addition of a small quantity of an oxidant was found to catalyze this reaction, with the result of increasing the reduction potential immediately to its maximum.

Change of rotatory power of purified egg albumin as evidence of the mode of combination of acid and alkali with proteins, H. J. Almquist and D. M. Greenberg (*Jour. Biol. Chem., 93 (1931), No. 1, pp. 167–170, fig. 1*).—Up to pH 11, addition of sodium hydroxide to a highly purified solution of ovalbumin had little effect, according to the results shown by the authors of this contribution from the University of California Medical School, upon the optical rotation of the protein, the initial figure having been $[\alpha]_D^{25} = -30.8°$. From pH 11 to pH 12.6, where a definite maximum of $-60.6°$ was reached, the further additions of the alkali were accompanied by sharp rises in the optical rotation.

The addition of acid sharply increased the negative rotation figure to a definite maximum at $-35.1°$, attained at pH 3.15. The starting point in each case was the approximately isoelectric point of pH 5.04. It is noted that these results favor the theory of chemical combination of the protein with the added alkali rather than that of colloidal adsorption.

Studies on the hemicelluloses.—I, The evolution of carbon dioxide by plant materials and some hemicelluloses under the action of boiling twelve per cent hydrochloric acid, E. Anderson (*Jour. Biol. Chem., 91 (1931), No. 2, pp. 559–568*).—Use was made of the property of uronic acids to yield carbon dioxide when heated with 12 per cent hydrochloric acid in the work reported in this contribution from the University of Arizona, as well as of the naphthoresorcinol test. Of this last-named reaction it is stated that "the test is much more conclusive when applied to the salts formed by hydrolysis of the hemicelluolose, and in general this procedure was followed."

"While many hemicelluloses contain uronic acids and are thus uronides of the sugars, others, such as that from vegetable ivory nuts, contain no uronic acid but are true polysaccharides. Some plant materials, such as white birch sawdust and corncobs, apparently contain two or more hemicelluloses, which may be isolated by variation in the method of extraction. Other plant materials, such as cottonseed hulls, apparently contain but a single hemicellulose. Partial hydrolysis of some of the hemicelluloses isolated above yielded reduc-

ing sugars together with aldobionic acids similar to those isolated from some of the plant gums. One such aldobionic acid from cottonseed hull hemicellulose was isolated as the barium salt. It thus appears that some of the uronic acid hemicelluloses are similar in their general structure to some of the plant gums."

Oxidation and reduction relations between substrate and products in the acetone-butyl alcohol fermentation, M. J. Johnson, W. H. Peterson, and E. B. Fred (*Jour. Biol. Chem.*, *91* (*1931*), *No. 2*, *pp. 569–591*, *figs. 5*).—The fermentation of glucose, mannitol, calcium gluconate, and arabinose by the acetone-butyl alcohol microorganism *Clostridium acetobutylicum* was studied in the course of the investigation of which report is made in this contribution from the University of Wisconsin, with special reference to the relation between the degree of oxidation of the compound fermented and the distribution of the various oxidized and reduced products of fermentation. When mannitol, a reduced compound, was fermented, large amounts of hydrogen and of butyl alcohol were produced. The production of acetone was small, and almost as much butyric as acetic acid was formed. When glucose was fermented, less hydrogen and butyl alcohol and more acetone were produced than were formed from mannitol. The ratio of acetic to butyric acid was higher in the case of glucose. Calcium gluconate, which was found to be oxidized more than was glucose, was fermented largely into acids, "because of the neutralizing effect of the calcium ion and the oxidized nature of the substrate. Here much more acetone than butyl alcohol is formed, and there is a high acetic to butyric acid ratio. Hydrogen production, however, being a corollary of acid production, is high. When arabinose, which has the same degree of oxidation as glucose, is fermented, an 'oxidized' type of fermentation is produced. Acetone production is high and butyl alcohol production is low. The acid produced is largely acetic. The production of hydrogen is small.

"The appearance of an oxidized type of fermentation from arabinose seems to be related to the ready splitting off of only 1 molecule of carbon dioxide for each molecule of pentose fermented. The resulting scarcity of hydrogen available for reduction results in a large production of a substance whose formation does not involve reduction reactions, namely, acetone. The total amount of carbon dioxide evolved, is, however, more than can be accounted for by a hypothesis predicating the preliminary splitting of the pentose molecule into a two-carbon and a three-carbon compound, and with the subsequent fermentation of these fractions in the conventional manner."

The total amounts of carbon dioxide and hydrogen evolved in the fermentations of six-carbon compounds were found compatible with the mechanisms which have been proposed for the butyl fermentation. The gas production, however, as well as the balance between the oxidized and reduced compounds produced, indicated the presence in the glucose fermentation of an unknown intermediate product.

"A convenient method of drawing up an oxidation-reduction balance for a fermentation is outlined. The oxidation-reduction potentials prevailing in these fermentations have been measured. Although there is an extremely rapid fall in potential during the induction period of the fermentation, a hydrogen overvoltage is never developed, except perhaps in the case of the calcium gluconate fermentation."

Influence of alkalies on available chlorine and on germicidal effect of sodium hypochlorite in presence of organic matter as ice-cream mix, F. W. Fabian, H. A. Beavens, C. S. Bryan, and J. M. Jensen (*Indus. and Engin. Chem.*, *23* (*1931*), *No. 10*, *pp. 1169–1174*, *figs. 7*; *abs. in Michigan Sta.*

Quart. Bul., 14 (1932), No. 3, p. 216).—The authors of this contribution from the Michigan Experiment Station find that in the absence of organic matter sodium hypochlorite was quite stable for one hour at 50° C. Sodium hydroxide and trisodium phosphate had a stabilizing influence. Sodium carbonate in small amounts exerted a stabilizing influence but in larger amounts tended to decompose it.

In the presence of organic matter, as ice-cream mix, sodium hypochlorite rapidly lost its available chlorine, although increasing the amount of ice-cream mix did not cause a corresponding quantitative decrease in the amount of available chlorine.

The addition of alkalies to sodium hypochlorite in the presence of ice-cream mix increased the loss of available chlorine, the loss being proportional to the amount of alkali added. The order of decreasing effect was sodium hydroxide, sodium carbonate, and trisodium phosphate.

Large numbers of bacteria reduce the amount of available chlorine; and with respect to bactericidal effectiveness it is stated that "a comparison of the germicidal effect of sodium hypochlorite to which 0.5 per cent solutions of sodium carbonate, sodium hydroxide, and trisodium phosphate have been added shows that, in the presence of ice-cream mix: (1) Sodium carbonate is the least effective; (2) there is a correlation between the amount of available chlorine present and the germicidal effect of the solution; this is especially true in the case of the control solution containing no alkali and the 0.5 per cent sodium carbonte solution; (3) 0.5 per cent of sodium hydroxide or trisodium phosphate when added to sodium hypochlorite killed the bacteria in practically all cases; (4) the effectiveness of sodium hydroxide no doubt may be attributed in part at least to its pH since experiments showed that sodium hydroxide greatly influenced the loss of the available chlorine in the presence of amounts of ice-cream mix such as were used; and (5) the addition of 0.5 per cent of trisodium phosphate to the sodium hypochlorite solutions showed that it was equally as good as sodium hydroxide and decidedly better than sodium carbonate in killing the bacteria."

Bibliography of ethylene dichloride, W. A. Gersdorff (*U. S. Dept. Agr., Misc. Pub. 117 (1932), pp. 60*).—Following a brief sketch of the history and uses of ethylene dichloride, the author presents 469 annotated references, together with a list of work reported from 1795 to 1929. A subject index and a chronological index are included.

Some factors influencing the activity of peroxidase, R. W. Getchell and J. H. Walton (*Jour. Biol. Chem., 91 (1931), No. 2, pp. 419–433, figs. 2*).—The authors present as a contribution from the University of Wisconsin a part of the data of a thesis research involving modifications in the methods of preparing peroxidase solutions from horseradish roots and of testing the activity of the preparations. The effects of variations in H-ion concentration and in the concentrations of the substrate and of the enzyme were measured by determining colorimetrically the purpurogallin formed as a result of the catalysis by the enzyme of the reaction between hydrogen peroxide and pyrogallol. The effects of irradiation with ultra-violet light, of aeration, of various reaction temperatures, of dialysis against a variety of membranes, and of various anions and cations were also evaluated.

Studies on the blue colorimetric method for the determination of phosphorus, H. D. Chapman (*Soil Sci., 33 (1932), No. 2, pp. 125–134, fig. 1*).—The author of this contribution from the California Experiment Station studied various sources of error in the colorimetric determination of phosphorus by means of the measurement of the blue compound formed on reducing phosphomolybdates (and other molybdate complexes).

The stannous chloride solutions used for the reduction were found capable of oxidising slowly even when protected by a layer of mineral oil. In 2-l lots, however, if stored in bottles of small cross section and protected by layers of mineral oil 1 cm thick, the reagent could be used for several months before deterioration became serious.

In the presence of silica and at low acidities, a silicomolybdate was shown to be formed. The color formed when this compound was reduced could not be distinguished from that developed from the phosphomolybdate. To prevent this error, it was found sufficient to combine with the molybdate reagent acid enough to prevent the initial reaction with silica. The silicomolybdate, once formed, persisted even after the acidity had been increased. Under proper conditions of acidity, 700 parts per million of silica did not interfere. Under conditions favoring the formation of the silicomolybdate, however, as little as 0.5 part per million was shown capable of producing error.

Ferrous iron in concentrations as low as 1 part per million was found capable of lessening the total of the color compound produced on reduction. This source of error was shown to be avoidable by adding the reducing agent immediately upon diluting the test solution to volume.

Nitrates, chlorides, or sulfates affected the accuracy of the method only when present in comparatively high concentrations.

The use of sodium hypobromite for the oxidation of organic matter in the mechanical analysis of soils, E. Troell (*Jour. Agr. Sci.* [*England*] *21* (*1931*), *No. 3, pp. 476–483*).—Freshly prepared solutions of sodium hypobromite (2.5 cc of bromine dissolved in 100 cc of cold normal solution of sodium hydroxide for the treatment of a 10-g sample of soil, the treatment to be followed by the addition of a second like quantity of the hypobromite solution after two hours, then standing overnight, and finally the destruction of the excess hypobromite by means of dilute ammonia) are recommended by the author of this contribution from the Rothamsted Experimental Station to replace boiling hydrogen peroxide solutions in the preparation of soils for mechanical analysis by the pipette method, on the ground that (1) soils containing manganese dioxide or large amounts of organic matter may be oxidized rapidly without heat; (2) changes in the clay through heating and the possible dissolution of considerable amounts of sesquioxides are avoided; (3) the reagents are cheaper, and, especially in the Tropics, more stable; and (4) further simplification in the technic of mechanical analysis is made possible.

A modified mechanical analysis, avoiding both acid treatment and the addition of a special deflocculating agent, is proposed; and "it is shown that oxidation is required for complete dispersion in soils in which there is a high ratio of organic to inorganic colloids."

Analytical methods for fertilizers, A. Suchier (*Die Analysenmethoden der Düngemittel. Berlin: Verlag Chemie, 1931, pp. 79, figs. 3*).—Under the head of phosphorus this condensed compendium of analytical methods takes up first the analysis of the raw materials, second, that of artificially prepared phosphatic fertilizers. Under the caption nitrogen are taken up (1) ammonium salts (including qualitative tests for the cyanide and thiocyanate radicles); (2) nitrates, natural and artificially prepared; (3) cyanamid; and (4) organic sources of fertilizer nitrogen. Under the head of potash, the naturally occurring and the prepared salts are similarly dealt with; and the two remaining main sections of the compilation present in a like manner the practical aspects of the analysis, respectively, of mixed fertilizers and of liming materials.

An application of the uranyl zinc acetate method for determination of sodium in biological material, A. M. Butler and E. Tuthill (*Jour. Biol. Chem., 93 (1931), No. 1, pp. 171–180*).—This contribution from the Harvard

Medical School presents in working detail modifications of the Kolthoff method for the precipitation of sodium as the triple acetate of uranyl, zinc, and sodium (E. S. R., 58, p. 608). The removal of phosphate (which interferes by precipitating the reagent) by means of uranyl salts is noted as yielding a precipitate difficult to handle and causing the sodium determination to give low results. Magnesia mixture has given satisfactory results, but the authors found powdered calcium hydroxide more desirable for use as phosphate precipitant in the work here reported upon.

A new color reaction for soluble organic sulfur compounds, I. W. Grote (*Jour. Biol. Chem., 93 (1931), No. 1, pp. 25–30*).—In a study of the reaction of organic hydrosulfyl compounds it was found that by making the test in a saturated solution of sodium bicarbonate, pH 8 to 9, instead of using the more commonly employed carbonate or hydroxide, the interference of ketones, aldehydes, creatinine, thio ethers, and many of the alkaloids could be eliminated almost entirely. With the use of potassium cyanide as a reducing agent, the test could be extended to the organic disulfides.

In the course of the experiments noted it was further observed that a solution of sodium nitroferricyanide ("nitroprusside"), "previously exposed to light for some time, gives an intense blue color with compounds of the thiourea type in addition to the normal purple-red color with C–S–H." A number of derivatives of sodium nitroferricyanide were then prepared, with a view to reproducing the substance formed under the influence of sunlight.

"Reduction of sodium nitroprusside in alkaline solution by means of hydroxylamine hydrochloride yields a yellow compound, sodium aquoferrocyanide, $Na_3Fe(CN)_5.H_2O$. . . . Treatment of this yellow compound with bromine water in neutral solution gives an intense purple compound. . . . This compound was found to give an intense blue with thiourea after several minutes, more quickly on warming, but not as promptly as the material prepared by sunlight. . . . On standing in solution for some time in the presence of sodium bicarbonate, the purple color of sodium aquoferricyanide is changed to a dark yellow-brown. This yellow compound reacts instantly with thiourea to give a blue color but does not give the usual nitroprusside reactions with mercaptans, etc. . . .

"A satisfactory test solution giving both the new reaction with C=S compounds and the usual nitroprusside reactions may be prepared as follows: *0.5 g of sodium nitroprusside (sodium nitroferricyanide) is dissolved in 10 cc* of water at room temperature, 0.5 g of hydroxylamine hydrochloride is added, folowed by 1 g of sodium bicarbonate. After evolution of gas has ceased, 2 drops of bromine are added. Excess bromine is removed by aeration and the dark greenish or black-brown solution filtered and made up to 25 cc. This solution behaves like that prepared by exposure of sodium nitroprusside to sunlight and contains a mixture of several compounds, one of which reacts with the thiourea type and another like ordinary nitroprusside. The solution is stable for about 2 weeks, gradually losing reactivity toward C=S. No further purification is necessary for general test use."

By means of this reagent it was shown to be possible to distinguish soluble organic sulfur compounds of the hydrosulfyl, disulfide, and thiocarbonyl types from other types and from one another. The new reagent could also be used for quantitative colorimetric estimation of thiosulfate, "thiocyanate, thiourea, and other compounds of the C=S type."

The determination of uric acid in the study of avian nutrition, J. L. St. John and O. Johnson (*Jour. Biol. Chem., 92 (1931), No. 1, pp. 41–46*).—In this paper from the Washington College Experiment Station the authors

describe a method for the determination of uric acid in avian excrement. This method has the advantage of being accurate in results obtained and economical in time and reagents. A method of obtaining and preparing samples for analysis is also described.

The basic amino acids of silk fibroin: The determination of the basic amino acids yielded by proteins, H. B. VICKERY and R. J. BLOCK (*Jour. Biol. Chem., 93 (1931), No. 1, pp. 105–112*).—This contribution from the Connecticut State Experiment Station reports the observation, among others, that if silver sulfate be employed during the precipitation of arginine and histidine from protein hydrolyzates containing an unusually high proportion of monoamino acids it is difficult to introduce an adequate excess of silver ion. It was further found that unless a considerable excess of silver ion be present a large part of the arginine may escape precipitation. These difficulties were avoided by employing silver nitrate for the preliminary precipitation. Silver sulfate was then used for the reprecipitation and separation of the two bases and the laborious washing required to remove nitric acid from the precipitates was thereby largely avoided.

Silk fibroin yielded 0.74 per cent of arginine, 0.07 per cent of histidine, and 0.25 per cent of lysine. A close analogy between the relative proportions of the bases yielded by silk fibroin and by wool was noted. A brief description of the most widely applicable method for the determination of the basic amino acids in proteins is given.

The basic amino acids of proteins: A chemical relationship between various keratins, R. J. BLOCK and H. B. VICKERY (*Jour. Biol. Chem., 93 (1931), No. 1, pp. 113–117*).—This is a contribution from the Connecticut State Experiment Station. In addition to their new data on the basic amino acids of the keratins of the two corals *Gorgonia flabellum* and *Plexaurella dichotoma*, of goose feathers, and of python and cobra skins, their figures for silk fibroin above noted, and their previous analyses of human hair and sheep wool (E. S. R., 63, p. 502), the authors present a summary of the proportions of the basic amino acids yielded by these keratins with a calculation of the molecular ratios of the bases one to another, by means of which it is shown that over the entire series of keratins the average ratio of the histidine : lysine : arginine is not far from 1 : 4 : 12.

"The fact that the keratins . . . obtained from animals widely separated phylogenetically should yield proportions of basic amino acids, the molecular ratios of which are so remarkably constant, is probably not without significance; it seems to justify a modification of the definition of a keratin which may be tentatively stated: A keratin is a protein which is resistant to digestion by pepsin and trypsin, which is insoluble in dilute acids and alkalies, in water and in organic solvents, and which, on acid hydrolysis, yields such quantities of histidine, lysine, and arginine that the molecular ratios of these amino acids are, respectively, approximately as 1 : 4 : 12."

Colorimetric determinations of cystine showed the proportion of this amino acid to vary among the several tissues between limits so wide as to indicate that there is no definite relationship between the cystine content and that of the histidine, lysine, and arginine group. "A high proportion of cystine is therefore not necessarily characteristic of the proteins usually designated as keratins."

The fractionation of American gum spirits of turpentine and evaluation of its pinene content by optical means, S. PALKIN (*U. S. Dept. Agr., Tech. Bul. 276 (1932), pp. 14, figs. 6*).—An assembly comprising a plate rectifying column, pressure regulator, and other accessory apparatus, which has been

found to function very smoothly and satisfactorily for the fractionation of turpentine in vacuum, is described. By distilling at fixed pressures, distillation temperatures became reasonably accurate reference points in the approach to the pure components, and closer correlation of distillation temperatures with composition of the respective fractions became possible.

Data relating to the composition of a number of turpentines with respect to the α and β pinene and tailings are given. These data were obtained from optical constants of the fractions studied.

Clarifying cider increases demands from consumers, R. E. MARSHALL (*Michigan Sta. Quart. Bul., 14 (1932), No. 3, pp. 208–214, figs. 3*).—Methods used in applying the cider clarification process of the New York State Station (E. S. R., 64, p. 713), the similar results obtained with reference to the quality of the product, and data as to the relative salability of the untreated and the clarified cider are here reported. An apparatus successfully used for filtration of the treated cider is described and illustrated. A diatomaceous earth filter aid was used in removing the precipitated matter with this filter.

With reference to production costs and returns and the relative salability of treated and untreated cider, it was found that on the assumption of the clarification of 100 bbls. of cider in a season with the materials, equipment, and form of the method here reported upon, clarification would cost a little less than 5 cts. a gallon. The clarified cider sold more readily than did the untreated cider and at a price increase more than covering the increased cost.

AGRICULTURAL METEOROLOGY

Solar radiation as a meteorological factor, H. H. KIMBALL (*U. S. Mo. Weather Rev., 59 (1931), No. 12, pp. 472–479, pls. 2, figs. 9*).—From the study of variations in solar radiation and the periodicity as related especially to weather changes, the author concludes that "weather changes are brought about, not by short-period trends of less than 1 per cent, but by the manyfold difference in the intensity of the solar radiation received by the earth in equatorial and polar regions." The great differences in temperature of these regions give rise to a turbulent polar-equatorial circulation, especially in winter. "It is to studies of this turbulent polar-equator movement of air that meteorologists look for improvements in weather forecasting."

Influences of Lake Michigan on east and west shore climates, C. B. ODELL (*U. S. Mo. Weather Rev., 59 (1931), No. 11, pp. 405–410, figs. 14*).—From a study of data on temperature, wind velocity, number of clear days and cloudy days, precipitation, and the number of days with snow, as observed at Milwaukee, Grand Haven, Green Bay, and Ludington, the author concludes that there are marked influences of Lake Michigan on the climate of its two shores. "There is a smaller annual range in temperature on east than on west shore, with a slight tendency for a delayed maximum. Critical temperatures for peach production are far more numerous on the west shore with March as the peak month on both sides of the lake." There was found to be a stronger winter westerly wind, a greater annual range in clear and cloudy days, greater fall and winter precipitation, and a greater number of days with snowfall on the east shore than on the west shore.

The probable values of seasonal rainfall in Los Angeles from 1850 to 1877, C. C. CONROY (*U. S. Mo. Weather Rev., 59 (1931), No. 11, pp. 433, 434*).—From a study of rainfall at Los Angeles from 1850 to 1877, the author concludes that the influence of the Brückner cycle and the double Wolf cycle is "clearly discernible in the estimates made for the period 1850–1877, and that

the results seem to forecast the early beginning of a wetter rainfall régime in this region."

Meteorology and the forest fire problem, S. B. SHOW (*U. S. Mo. Weather Rev., 59 (1931), No. 11, pp. 432, 433*).—The importance and efficiency of the present forest fire forecasting service, with special reference to California, are briefly discussed.

Monthly Weather Review, [November–December, 1931] (*U. S. Mo. Weather Rev., 59 (1931), Nos. 11, pp. 405–448, pls. 12, figs. 23; 12, pp. 449–506, pls. 16, figs. 33*).—In addition to detailed summaries of climatological data and weather conditions for November and December, 1931, solar and aerological observations, and bibliographical and other information, these numbers contain the following contributions:

No. 11.—Influences of Lake Michigan on East and West Shore Climates, by C. B. Odell (pp. 405–410) (see p. 10); Easterly Gales in the Columbia River Gorge during the Winter of 1930–1931—Some of Their Causes and Effects, by D. C. Cameron (pp. 411–413); Free-air Winds at San Juan, P. R., by C. L. Ray (pp. 414–416); Sounding-Balloon Observations at Royal Center, Ind., during the International Month, September, 1930, by L. T. Samuels (pp. 417–426); Record Short-Period Rainfalls in Florida, by G. V. Fish (pp. 426–428); Edward H. Smith on the Scientific Results of the *Marion* Expedition of 1928 to Davis Strait and Baffin Land, by W. F. McDonald (pp. 428–430); Cloud Flights, by A. Lohr, trans. by E. R. Miller (pp. 430, 431); Shower and Drizzle, by W. J. Humphreys (pp. 431, 432); Meteorology and the Forest Fire Problem, by S. B. Show (pp. 432, 433) (see p. —); and The Probable Values of Seasonal Rainfall in Los Angeles from 1850 to 1877, by C. C. Conroy (pp. 433, 434) (see p. 10).

No. 12.—On the Water Vapor in the Atmosphere over the United States East of the Rocky Mountains, by L. P. Harrison (pp. 449–472); Solar Radiation as a Meteorological Factor, by H. H. Kimball (pp. 472–479) (see p. —); International Meetings in September and October, 1931, by C. F. Brooks (p. 480); Locarno Meeting of the Meteorological Committee, October, 1931, by C. F. Marvin (p. 481); White Lightning Versus Red as a Fire Hazard, by W. J. Humphreys (p. 481); Several Cloud Spouts, by E. M. Brooks (p. 482); Preliminary Statement of Tornadoes in the United States during 1931, by H. C. Hunter (p. 483); and The Weather of 1931 in the United States, by H. C. Hunter (pp. 483, 484) (see below).

The weather of 1931 in the United States, H. C. HUNTER (*U. S. Mo. Weather Rev., 59 (1931), No. 12, pp. 483, 484, pls. 2*).—It is stated that "the year was marked by unusual warmth over the greater part of the country, and was somewhat warmer than normal in all but a very few small areas. Temperatures were particularly above normal in the months usually styled the winter months—December, January, and February—also considerably in the autumn months and July. . . . The precipitation was deficient in the country as a whole, but to a considerably less extent than in 1930."

Climatic conditions [at the Sacaton field station, Arizona], C. J. KING and H. F. LOOMIS (*U. S. Dept. Agr. Circ. 206 (1932), pp. 3–7*).—Temperature, rainfall, evaporation, and velocity of winds at the U. S. D. A. field station at Sacaton, Ariz., during 1930 and preceding years are recorded and discussed. The climatic conditions of the middle Gila and Salt River Valleys are briefly described. The climate of the region is "characterized by mild sunny winters, long hot summers, and warm dry springs and autumns." The annual rainfall averages slightly less than 10 in., the driest period being during April, May, and June. Humidity is low, and there is a wide range (about 85° F.) in tem-

perature between day and night. The long period free from killing frosts, about 263 days, "makes it possible to grow to maturity crops of a subtropical nature, such as Egyptian cotton, dates, olives, and pomegranates." Small differences in elevation, topography, and air drainage were found to be "responsible for a considerable difference in the general character of the climate especially the humidity, rainfall, and minimum temperatures."

A brief summary of the weather conditions for the year 1930 at Wooster, C. A. PATTON (*Ohio Sta. Bul. 497 (1932), pp. 194–200*).—Observations on temperature, precipitation, cloudiness, wind, and length of growing season at Wooster during 1930 are summarized and compared with data for previous years and for the State at large in certain cases.

Meteorological report for 1932, F. E. HEPNER (*Wyoming Sta. Rpt. 1931, pp. 57–60*).—The usual summaries are given of observations on pressure, temperature, precipitation, wind, frost-free period, and sunshine at the University of Wyoming, Laramie, with brief notes on the weather of the year.

SOILS—FERTILIZERS

Putting first things first in agronomy, F. J. SIEVERS (*Jour. Amer. Soc. Agron., 24 (1932), No. 1, pp. 29–32*).—In this contribution from the Massachusetts Experiment Station, the author notes how various phases of the study of soils have been overemphasized, and suggests that intensive effort centered upon the maintenance or upbuilding of the organic matter content of the soil may also be overdone.

"Instead of placing our primary and major emphasis on determining in minute detail the processes involved in soil organic maintenance, we had better find the soil treatment necessary to produce the best and most profitable yield and feel secure that the greater supply of crop residues resulting from large yields will automatically provide soil organic matter in amounts adequate to satisfy all normal demands." As evidence that such a view is practical are cited the cases of truck farmers who have been obliged, "with entirely satisfactory results," to substitute commercial fertilizers for animal manures; and of the Connecticut Valley tobacco grower, who "has been so successful in maintaining yields with commercial fertilizers as the only source of plant food applied that he would not now use animal manure on his soil even if it could be obtained."

Bibliography of agricultural chemistry.—I, Soil science. II, Soil analysis, H. NIKLAS, F. CZIBULKA, and A. HOCK (*Literatursammlung aus dem Gesamtgebiet der Agrikulturchemie. Band I, Bodenkunde. Band II, Bodenuntersuchung. Munich: Agr. Chem. Inst. Weihenstephan der Tech. Hochschule München, 1931, vols. 1, pp. XXXVI+1008; 2, pp. XXVIII+199*).—Volume 1, soil science, contains eight main headings, with numerous and detailed subdivisions, as follows: General literature, formation of soils, soil chemistry, soil physics, relations between soil and surrounding, division of soils, soils of different countries, and composition of soils, rocks, and minerals.

Volume 2, soil analysis, covers, with similarly detailed classification of the references, soil analysis in general, sampling of soil, chemical soil analysis, physical soil analysis, microbiological soil analysis, microscopic soil analysis, mineralogical soil analysis, and analysis of rocks.

Each volume contains both subject index and author index. These, together with the tables of contents and the division headings, are in both volumes given in German and in English.

[Soil Survey Reports, 1928 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1928, Nos. 14, pp. 36, fig. 1, map 1; 15, pp. 34, fig. 1, map 1*).—The two surveys here noted were made with the cooperation, respectively, of the North Carolina Department of Agriculture and the State Experiment Station, and the Georgia State College of Agriculture.

No. 14. *Soil survey of Person County, North Carolina*, R. C. Jurney et al.—Located in the north-central part of North Carolina, Person County, is an area of 256,640 acres of a surface relief ranging from undulating to steep and broken. Underdrainage is in some parts inadequate by reason of a heavy impervious clay subsoil and surface drainage ranges through good to excessive.

Of 22 types here classified as 12 series, Georgeville silty clay loam, 16 per cent of the county, and Wilkes sandy loam 14.3 per cent, are the most extensive.

No. 15. *Soil survey of Elbert County, Georgia*, G. L. Fuller and B. H. Hendrickson.—Elbert County, in northeastern Georgia, consists of 232,960 acres of a dissected plain in the piedmont plateau, having narrow V-shaped valleys, with a "flatwoods" tract in the southeastern part of the county. Drainage ranges from adequate to excessive throughout the county. "Checking erosion is a paramount problem which needs greater facilities for year-round control."

Of the 12 series, represented by 15 types, the greatest areas are those of Cecil clay loam which takes up 31.5 per cent of the county, Cecil sandy loam occupying 25.8 per cent, and Iredell loam 12 per cent.

A new modification of the three-compartment electrodialysis apparatus, A. Löddesöl (*Jour. Amer. Soc. Agron., 24 (1932), No. 1, pp. 74–81, figs. 2*).—The author presents as a contribution from Cornell University the design, illustrated by a photograph and a drawing, of a soil electrodialysis apparatus in which the three compartments are all of glass, the cathode membrane preferably of parchment, and the anode membrane of cellophane. Both the cell proper and its supporting framework are shown. Cooling is effected by a continuous envelope of cold running water about the more or less globular central chamber, the water being emitted from many fine perforations in the under side of a hollow brass ring placed about the neck of the vessel requiring to be cooled.

Factors affecting the amount of electrodialyzable ions liberated from some soils, A. Löddesöl (*Soil Sci., 33 (1932), No. 3, pp. 187–211, pl. 1, fig. 1*).—The author reports from the Agricultural College of Norway an investigation into the conditions affecting the results of soil electrodialysis, carried out at Cornell University and Ohio State University, the soils used having been three samples of Volusia silt loam and three of Ontario loam.

The experiments on the concentration of the soil suspension "clearly indicate" the advantage of using relatively small soil samples, the larger samples requiring an excessive time for the completion of the process. "For ordinary analytical purposes 25 g of mineral soil and 10 g of muck soil should be recommended." It is noted, however, that the size of the samples should not be reduced too far on account of the heterogeneity of the material.

Increasing the distance between electrodes from 6 to 9 and from 9 to 12 cm resulted in "significant decreases in the amounts of ions removed from the soil," these differences being noticeable especially in the first fractions.

The experiments with various applied voltages indicated a marked, but not proportional, increase in the removal of cations with the increasing voltage. Doubling the voltage applied increased the amount of the cations removed in the period allowed in the ratio of about 1:1.5. Reference is made to the work of Wilson (E. S. R., 61, p. 506) as showing somewhat similar effects of increasing voltages.

Of the work with parchment and with cellophane membranes it is stated, in part, that "the greater quantities of ions transported when cellophane was used as anode membrane indicate that this material should be preferred in comparison with parchment. The ammeter reading during the experiments also showed that the current rose to higher values and the maximum amperage was obtained after shorter periods of time, which indicates that the resistance due to the anode membrane itself was less in the cases where cellophane was used." The results of the electrodialysis are compared also with those of the application of the base-exchange reaction with ammonium acetate. The author used his own modification, noted above, of the Mattson 3-compartment cell (E. S. R., 56, p. 115).

Dehydration, soil acidity, and exchangeable bases, H. G. COLES and C. G. T. MORISON (*Soil Sci., 33 (1932), No. 2, pp. 115–124*).—In this investigation, reported from the University of Oxford, the amounts of bases extractable by ammonium (or sodium) chloride were the same before and after heating the soil; there was an increase in water-soluble bases after heating the soil; alternate washing and heating of the soils caused the pH to fall to a figure approximating that of the base-free soils, except in the case of a peat, and of a soil from Dodoma, Tanganyika; and it was possible in some soils to remove all the exchangeable bases by a process of alternate washing and drying at 98° C.

The bases went into solution for the most part as sulfates, as did also the iron and aluminum. The two elements last named continued coming into solution after all of the calcium had been removed. The soils studied still contained sulfates at the end of the washing and heating treatments, and it appeared that "the amount of bases removed from the soil in the water extract after heating depends on the quantity of SO_4'' which can come into solution."

Equilibria of the base-exchange reactions of bentonites, permutites, soil colloids, and zeolites, A. P. VANSELOW (*Soil Sci., 33 (1932), No. 2, pp. 95–113, figs. 2*).—From the preliminary results noted by the author in the present contribution from the California Experiment Station, confirmation of the conclusions of previous investigations, that the base-exchange constituents of soils and bentonites are remarkably similar and that permutites and zeolites differ from the base-exchange complex of soils in many respects, could be drawn; and "the investigation of the sodium-potassium exchange reactions of bentonites and soil colloids showed that there are at least two and very probably more classes of bentonites and soil colloids. The results further indicate that the base-exchange complex anions of bentonites and soils are monobasic, in harmony with the work of Kerr [E. S. R., 59, p. 420]."

The results of the experimental investigation of the calcium-ammonium exchange reactions of a bentonite and a soil colloid could best be interpreted by the hypothesis of the formation of a mixed crystal, one replaceable cation being partially replaced by another cation. The sodium-potassium and the calcium-ammonium exchange reactions of all the materials that were studied showed pronounced hysteresis ("failure to attain 'true' equilibria"). An attempt to remove, by repeated transformation, the hysteresis in the calcium-ammonium exchange reaction of a bentonite did not reduce it appreciably. On the other hand, in the case of the bentonite, none of the exchange reactions involving two divalent cations showed any appreciable amount of hysteresis. Experimental evidence indicated that the observed effect probably is not one of rate of reaction or insufficient time for the attainment of equilibrium, but is probably a phenomenon associated with the crystal structure of the alumino-silicates.

The pH and the phosphorus content of the expressed liquids from soils and plant tissues, M. M. McCool and W. J. Youden (*Contrib. Boyce Thompson Inst., 3 (1931), No. 2, pp. 267–275, fig. 1*).—Using a hand screw press and a hydraulic press to provide pressures up to 30,000 lbs. to the square inch, the authors expressed in part the liquid content of a brown, partially decomposed sphagnum peat soil of German origin, of a dark brown, mainly sedge peat, and of a black aquatic peat, the two samples last named having been collected near Fishkill, N. Y. Certain herbaceous and woody stems were similarly pressed.

Even 1,000 lbs. pressure yielded solutions of which the phosphate content and H-ion concentration were markedly lower than those of the liquids obtained at lower pressures from the same sources. Further reductions in concentration accompanied further increases in pressure.

"There was appreciably less phosphorus in the liquids derived from the [soil] samples by the application of 4,000 lbs. per square inch to them than there was in the liquid obtained by means of the hand press. The solutions obtained by means of the very high pressures in several instances contained less phosphorus than one-half part per million. Upon rewetting pressed peat specimens and hand pressing several hours later, the hydrogen ion concentration and the phosphorus in the liquid thus obtained were nearly as great as they were in the liquid obtained by the first hand pressing."

Soil-acidity studies with potatoes, cauliflower, and other vegetables on Long Island, P. H. Wessels (*New York Cornell Sta. Bul. 536 (1932), pp. 42, figs. 16*).—Two series of plats at the Long Island Vegetable Research Farm, 130 altogether, were adjusted to various degrees of acidity by applications of sulfur or sulfuric acid, or of lime, as each case required, and, with uniform cultural care, were cropped to various vegetables, the results here reported covering the work of four years. It is cautioned that "the suggestions given here are intended for Long Island conditions and practices; they may or they may not apply elsewhere."

The pH range for a maximum production of cauliflower was shown to be that of from 5.5 to 6.6. Of the two varieties of this crop upon which report is made, Berlin Forcing tolerated fairly well an acidity represented by pH 4.7, whereas Dwarf Erfurt was seriously affected by "whiptail." The general impression that potatoes will do well on acid soils was only partially confirmed. "The fact that soils may be too acid for the best growth of potatoes has been largely overlooked or not sufficiently stressed. . . . The figures presented show that on this soil a reaction between pH 4.8 and 5.4 should be maintained if potatoes are to be grown on the same soil year after year."

The determination of the pH values of the loess soils of North China [trans. title], D. Wang (*China Geol. Survey, Soil Bul. 3 (1931), pp. [3]+17+[42], pls. 3, fig. 1; Ger. abs., pp. 1–17*).—The soils of North China were found uniformly to be of a slightly alkaline reaction, the pH values recorded all lying within the range 8.05 to 8.65. Only the Manchurian soils were found to have slightly lower pH values, a condition attributed to climatic influences.

With reference to the relation between soil pH values and agricultural crop plants it was observed that pH values of from 8.05 to 8.3 appeared harmless, that from pH 8.3 to pH 8.5 injury appeared not to be impossible, and that pH values above 8.6 were definitely injurious.

Among means of improving productivity are mentioned (1) the drainage of certain soils, whereby wheat yields could practically be doubled, and (2) the use of ammonium sulfate to render soil reaction more suitable for certain Pinus and Thuja species, for *Robinia pseudacacia*, etc. A considerable group of pot experiments are recorded.

Permeability of soils (*New Mexico Sta. Rpt. 1931, pp. 37, 38*).—Results of applications of manure and of various chemicals upon the permeability and tilth of a hard impermeable clay loam are recorded.

On the origin of the uronic acids in the humus of soil, peat, and composts, S. A. WAKSMAN and H. W. REUSZER (*Soil Sci., 33 (1932), No. 2, pp. 135–151*).—This contribution from the New Jersey Experiment Stations reports determinations of pentosans, of "total hemicelluloses" (inclusive of polyuronides in the terminology adopted by the present authors), and of uronic acid complexes in plant materials, in composts in which plant substances are undergoing active decomposition, in peats, in forest soils, and in mineral soils.

The results show that the true pentosans are attacked more rapidly by microorganisms than are the uronic acid complexes. Plant materials were found to vary in the relative concentration of the different hemicelluloses and in the relative rapidity with which these complexes are decomposed by microorganisms. With the advance of decomposition of plant residues, there was observed a progressive diminution of the pentosans and a relative increase of the uronic acid complexes.

Manuring of soil resulted in an increase in the pentosan content, whereas continued cultivation of soil without the addition of fresh organic manures or plant residues was found to result in a rapid reduction of the total soil humus and a corresponding relative increase in the content of uronic acid complexes.

Effects of irrigation and alfalfa production on arid soil composition, T. J. DUNNEWALD (*Jour. Amer. Soc. Agron., 23 (1931), No. 9, pp. 744–750*).—Alfalfa grown on irrigated land was found by the author of this contribution from the Wyoming Experiment Station to build up the organic matter and nitrogen content of arid soils and appeared to bring up iron from the subsoil, counteracting the effects of too high a lime content in the surface soil. It is recommended that alfalfa be rotated with cultivated crops or that applications of superphosphate be made in order to maintain the yields on the older fields low in available phosphates. Irrigation removed large amounts of basic material from the soils of high lime content and appeared to increase the proportion or the solubility of silica, especially in the subsoils. The average reaction of the high-lime soils was found to be lowered appreciably, but that of the low-lime soils did not show such an effect.

Soil investigations (*Wyoming Sta. Rpt. 1931, p. 9*).—Under this head is noted a study of the effect of stirring, abundance of moisture, and the addition of organic matter in increasing the availability of the soil phosphate content.

[Indiana experiment field reports, 1930], A. T. WIANCKO ET AL. (*Indiana Sta., Expt. Farms Rpts., Herbert Davis Forestry Farm, 1923–1930, pp. 4; Francisco Field, 1917–1930, pp. 4, fig. 1; Huntington Field, 1919–1930, pp. 4; Jennings Co. Field, 1921–1932, pp. 8, fig. 1; Pinney-Purdue Field, 1920–1930, pp. 8; Purdue-Vincennes Farm, 1925–1930, pp. 7; Sand Field, 1924–1930, pp. 8; Scottsburg Field, 1906–1930, pp. 4, fig. 1; Soils and Crops Farm, 1915–1930, pp. 20, figs. 2; Worthington Field, 1913–1930, pp. 4, fig. 1*).—Under the heads, how to treat the kind of land, the general fertility test, and principal results to be noted in the various trials made (on fertility, liming materials, tile drainage, crop rotations, and pasture fertilizers), results for the periods respectively indicated are again briefly summarized (E. S. R., 62, p. 317). Variety tests for wheat, rye, soybeans, corn, oats, barley, and alfalfa, and tests of winter hardiness of red clover from different regions are included.

[Soil and fertilizer investigations of the Ohio Station], E. E. BARNES, R. BRADFIELD, W. H. ALLISON, C. J. SCHOLLENBERGER, [L. A.] NAFTEL, G. W. CONREY,

M. A. BACHTELL, and S. C. HARTMAN (*Ohio Sta. Bul. 497 (1932), pp. 45–52, 167, 168, figs. 10*).—The report notes certain of the results of investigations on the efficiency of applications of phosphate as affected by soil reaction, base saturation in soils as measured by the soil-calcium carbonate-air equilibrium, an investigation of the methods used for measuring the reaction of the soil by means of the glass electrode, and the effect of liming at different rates on the pH value of 7 Ohio soils.

The work of the Washington County Experiment Farm is briefly noted under the captions, manure helps solve fertility problem, and soil building.

Nitrogen balance in a four-year grain rotation, 1881 to 1921, J. W. WHITE and F. J. HOLBEN (*Jour. Amer. Soc. Agron., 23 (1931), No. 9, pp. 723–740, fig. 1*).—From a 4-year grain rotation included in a set of fertility experiments now of 40 years' duration, the authors of this contribution from the Pennsylvania Experiment Station found the nitrogen accumulations brought about by nonsymbiotic fixation during the periods when the plants were in sod, together with the nitrogen supplied by clover roots, to be sufficient to meet the normal demands of the grain crops provided lime, phosphates, and potassium were liberally supplied.

The results of a supplementary set of experiments on various sources of phosphate (E. S. R., 63, p. 621) further suggested that "heavier applications of superphosphate on the PK and PKN treatments would have brought about a somewhat higher level of crop yields which, in turn, would have resulted in a more economic utilization of the applied nitrogen." The major limiting factor for crop production, however, was found to be that of moisture distribution during the growing season rather than that of a lack of plant food.

The effects of summer green manures on the ammonia and nitrate contents of soils cropped for winter wheat: An examination of the Woburn green manure plats, T. J. MIRCHANDANI (*Jour. Agr. Sci. [England], 21 (1931), No. 3, pp. 458–468, figs. 3*).—A report of certain of the green manuring experiments on the Woburn experiment field is contributed from the Rothamsted Experimental Station, Harpenden, England.

Wheat was found less good after two summer crops of tares (vetch, *Vicia sativa*) than after two mustard crops. "This result was obtained many times, and in recent years the wheat yields were extremely low after both green manures." Further, "regular soil analyses for nitrate and ammonia through 1928 and 1929 showed that the mean nitrate content was extremely low (1.2 parts of nitric nitrogen per million of soil). During the cold, dry winter of 1928–29 the ammonia nitrogen was several times greater than the nitrate nitrogen."

An added evidence of an actual nitrogen deficiency was afforded by large responses to top dressings of sodium nitrate both in the 1929 and the 1930 wheat crop. The belief that the two green manure crops did not give a good preparation for the wheat because of their inability to provide available nitrogen in early summer is put forward.

Winter leaching and the manurial value of green manures and crop residues for winter wheat, E. M. CROWTHER and T. J. MIRCHANDANI (*Jour. Agr. Sci. [England], 21 (1931), No. 3, pp. 493–525, figs. 7*).—"It is suggested that the striking failure of winter wheat grown in rotation with two summer crops of tares or mustard on the sandy soil of the Woburn Experimental Station is due to the production of nitrate and ammonia from the green manures at times when the wheat is unable to use them efficiently and to the consequent loss of nitrate in the drainage. Owing to its low C : N ratio, the nitrogen in

tares nitrifies very rapidly and the loss by leaching is very great. Mustard, on the other hand, reduces the winter loss, but the nitrogen present in the mustard and that absorbed in the decomposition of the excess carbon compounds are liberated too slowly to be utilized efficiently by the wheat, and much of the nitrate subsequently produced is also lost by leaching."

Nitrification experiments and pot experiments with wheat as the test plant amplified the above conclusions. "It is suggested that early nitrate formation reduces the yield not only by increasing the removal of nitrate by leaching but also by increasing the amount converted by the soil microorganisms into forms which become available again only very slowly."

Is the soil type homogeneous with respect to its fertilizer needs? T. L. Lyon (*Jour. Amer. Soc. Agron., 24 (1932), No. 1, pp. 58–71*).—This contribution from the New York Cornell Experiment Station deals with an investigation of the responses to fertilizer treatment shown by 4 soil types. From 2 of these 4 samples each were obtained, while of the other 2, each was sampled at two points. Each of these samples consisted of from 9 to 10 tons of surface and subsoil and was placed in galvanized iron rims imbedded in the ground (E. S. R., 65, p. 621). All of the soils were limed to the indicated requirement and were cropped through a period of 9 years under a series of comparative fertilizer treatments.

Crop responses to single fertilizer ingredients were shown to exhibit such discrepancies between the results on samples of the same soil type, in the cases of some of the types studied, "as to raise a question regarding the sufficiency of the test on a single field to indicate the needs of the type in general." Other types responded more uniformly. On comparing these results of experiments on New York State soils with those from 10 fields on 3 soil types at the Illinois Experiment Station (E. S. R., 61, p. 423), the authors find the results of these experiments to agree with those of their own investigation of the behavior of New York State soils. "In the light of these experiments it would not appear to be always possible to determine with accuracy the fertilizer needs of an entire soil type by means of experiments in one locality.

"It may be asked whether it is worth while to try to distinguish between soil types of the same class in the application of fertilizers, or whether all types should receive the same treatment? The results of the experiments indicate that the latter does not hold for all soil types. In some cases all samples and fields of a given type responded more markedly to a given fertilizer ingredient than did any sample of another type. On the other hand, there were other soil types that responded so similarly to all fertilizer constituents that it is unnecessary to distinguish between them in applying fertilizer.

"The experiments emphasize the need for many more tests of each soil type than is practicable with field trials."

A probable cause of the small response to fertilizers in the cotton regions of Armenia, K. P. Mirimanian (*Jour. Amer. Soc. Agron., 23 (1931), No. 9, pp. 716–722, fig. 1*).—Yields were found to be correlated with an increase in noncapillary porosity, "as well as with an increase in replaceable calcium which usually leads to an improvement in the physical properties of soils." The low response to fertilizers observed in the soils under investigation was therefore attributed, tentatively, rather to the unfavorable physical condition of the soil than to the fertilizer material itself.

The rôle of chalk in calcareous soils, S. Das (*Jour. Amer. Soc. Agron., 23 (1931), No. 9, pp. 709–716, figs. 2*).—Pot experiments, in which a soil of low calcium carbonate content was mixed (1) with 5, 10, 20, or 30 per cent of chalk and (2) with 5 per cent of chalk together with 5, 15, or 25 per cent of

sand, were conducted by the author of this contribution from the Imperial Institute of Agricultural Research, Pusa, India, with a view to determining the effect of the calcium carbonate content of calcareous soils. In addition to the direct effect upon crop yields, the effects both of the chalk and of the sand on the moisture-holding capacity of the soil were investigated.

The chalk increased the grain yields, up to the largest proportion used, 30 per cent. Sand, in combination with 5 per cent of chalk, brought about yields greater than those from the control soils to which nothing had been added, up to 25 per cent additions of the sand. The largest yield of the sand series, however, was that from the soil with 5 per cent of chalk and 5 per cent of sand. The improved yields were "attributed, among other factors, to an improved physical texture of the soil induced by mechanical opening."

The moisture-holding capacity dropped off with increasing additions either of the chalk or of the sand, the rate of decrease being decidedly sharper in the case of the sand. With the decrease in moisture-holding capacity, the yields are represented as rising to the maximum point and then dropping off, with further decrease in the moisture-holding capacity to a final value below that of the controls.

Studies on sulfur oxidation, D. I. AQUINO (*Iowa State Col. Jour. Sci., 6 (1931), No. 1, pp. 65–87, fig. 1*).—The work here reported included investigations of sulfur oxidation, the numbers of soil bacteria and molds, soil reaction and moisture content, etc.

The soils studied showed a definite sulfur oxidizing power varying with the different soil treatments, manure, for example, appearing to cause a slight increase in sulfur oxidation. Lime also apparently brought about a small increase in the sulfur oxidizing efficiency of the soil. The phosphate treatments caused a still greater increase in the sulfur oxidizing power of the soil, superphosphate appearing slightly more effective than rock phosphate.

The sulfur oxidizing power of the soils was found correlated with the numbers of bacteria. The numbers of molds in the soils were not correlated with the sulfate production.

Dextrose, when added to the soils, retarded the process of sulfur oxidation. The rate of sulfur oxidation in the soil was influenced by the various amounts of sulfur added in the tests. Sulfur oxidation was most vigorous in the presence of the smallest sulfur applications. The application of sulfur to the soil brought about an increased hydrogen-ion concentration, and retarded the process of nitrification. The highest concentrations of sulfur used did not inhibit the process, however. Lime not only increased the sulfur oxidizing power of the soil, but also tended to decrease the injurious effect of dextrose on sulfur oxidation.

Conservation of fertilizer materials from minor sources, C. C. FLETCHER (*U. S. Dept. Agr., Misc. Pub. 136 (1932), pp. 7, figs. 3*).—The paper takes up briefly the value of composts, the making of composts, and the use of chemicals in this work, presents some practical suggestions, takes up soil improvement by means of coal ashes and the fertilizer value of spoiled feeds, and concludes with a short section on analyses of various materials, with a table showing the nitrogen, phosphoric acid, and potash content of a large number of wastes and other materials.

Analyses of commercial fertilizers, fertilizer supplies, and home mixtures for 1931, C. S. CATHCART (*New Jersey Stas. Bul. 533 (1931), pp. 39*).—This bulletin forms the first part of a report of the fertilizer analyses for 1931, giving the analyses of 716 samples.

AGRICULTURAL BOTANY

Botany: Principles and problems, E. W. SINNOTT (*New York and London: McGraw-Hill Book Co., 1929, 2. ed., pp. XXI+441, figs. 270*).—This, the second edition of the work previously noted (E. S. R., 54, p. 123), though unaltered as regards the general features embodies several rearrangements of material and shows some changes of emphasis.

Botanists' aid and lexicon for gardeners, amateurs, and plant fanciers, A. VOSS, rev. by M. TESSENOW (*Botanisches Hilfs- und Wörterbuch für Gärtner, Gartenfreunde und Pflanzenliebhaber. Berlin: Paul Parey, 1929, 8. ed., rev. and enl., pp. [4]+262, figs. 294*).—To the previous edition (E. S. R., 59, p. 818) this makes a few additions which are detailed in the preface.

Strasburger's text-book of botany, H. FITTING, H. SIERP, R. HARDER, and G. KARSTEN, trans. by W. H. LANG (*London: Macmillan & Co., 1930, 6. ed., rev., pp. XII+818, figs. 861*).—The present edition of this work (E. S. R., 49, p. 125) is said to have been revised throughout with the seventeenth German edition. Some of the extensive changes are indicated.

Eduard Strasburger's textbook of botany, H. FITTING, H. SIERP, R. HARDER, and G. KARSTEN (*Eduard Strasburger's Lehrbuch der Botanik für Hochschulen. Jena: Gustav Fischer, 1931, 18. ed., rev., pp. X+640, figs. [868]*).—Other editions of this book have been noted (E. S. R., 26, p. 227; also see above). The order of presentation of the contained material has been preserved so far as practicable.

Measurements of total daily sunlight intensity with reference to the ecology of plant diseases, F. S. BEECHER (*Phytopathology, 18 (1928), No. 11, p. 951*).—A method accredited to R. F. Bacon and said to be inexpensive, readily portable, and reasonably reliable for measuring the cumulative effect of sunlight in the study of plant diseases was used to ascertain the percentage of total sunlight available to plants under varied conditions. The results attained averaged approximately for open frame 87 per cent, frame with thin single glass 70, with double glass 60, thin muslin 47, medium weight muslin 40, heavy muslin 8, shady portion of greenhouse from 15 to 20, central greenhouse from 30 to 35, and sunny portion from 35 to 45 per cent. The use of both the Uviarc quartz lamp and the 500-w Mazda proved very inadequate for plant illumination as compared with sunlight, besides suggesting that possibly the photochemical effect may be produced by a fairly wide part of the spectrum instead of being confined to the violet and ultra-violet range.

Formation of chlorophyll in plants exposed to ultra-violet rays [trans. title], S. COLLA (*Ann. Bot.* [*Rome*], *18 (1930), No. 3, pp. 329–349, pls. 5*).—Mercury vapor lamp radiation of from 3,300 to 3,900 a. u., with maximum intensity around 3,600 a. u., caused no injurious effect on the various plants tested, but always deepened the green color throughout the plant, with degrees of assimilation and of development comparable to the effects produced in weak light of normal quality. The color produced was due to chlorophyll development, the amount of which stood in relation to the duration and the distance of the light used.

In some species the chlorophyll formation was preceded by a brick-red fluorescence, supposedly different from that proper to the plant normally.

In germinating plants the amount of chlorophyll produced is supposed to be in relation to the quantity of light absorbed.

Influence of radium on seed germination [trans. title], G. MEZZADROLI and E. VARETON (*Atti R. Accad. Naz. Lincei, 6. ser., Rend. Cl. Sci. Fis., Mat. e Nat., 12 (1930), No. 1–2, pp. 73–80, fig. 1*).—Light dosage of seeds of common cereals

and legumes with gamma rays gave a favorable effect in hastening and increasing germination, stronger dosage an adverse effect. The stimulating effect persists in the seed, as is evident from the behavior of seeds planted two months after the irradiation.

Germination of seeds in fleshy fruits [trans. title], P. LAVIALLE (*Bul. Soc. Bot. France, 76 (1929), No. 3–4, pp. 276–279*).—Observations and considerations presented regarding the occurrence of germination in seeds while still contained in the fruits are said to show that such occurrence is exceptional.

Dormancy of seeds appears to stand in relation to greater or less deficiency of oxygen in the pulp, deficiency or absence of water in liquid form, high osmotic pressure in certain saps and resulting lack of equilibrium, or noncoincidence of maturity in the seeds with that in the inclosing mass of the fruit.

After-ripening, germination, and vitality of seeds of Sorbus aucuparia L., F. FLEMION (*Contrib. Boyce Thompson Inst., 3 (1931), No. 3, pp. 413–439, figs. 8*).—Studies with seed of *S. aucuparia*, European mountain-ash, showed them to undergo a period of dormancy immediately after ripening. A temperature of 1° C. or an alternating temperature from 1 to 5° gave good results if continued for from 2 to 4 months. Untreated granulated peat moss, pH 4, was the best stratifying medium. Attempts to break or shorten the rest period with chemicals, high pressure, ultra-violet rays, and electromagnetic waves were unsuccessful. Seed held in ordinary dry storage at room temperature for 6 months required a somewhat shorter afterripening at 1° than did the fresh seed. Stored dry at high or low temperatures, partially or entirely afterripened seeds underwent a secondary dormancy. This was true also in the case of partially afterripened seeds kept moist at higher temperatures.

Excised embryos afterripened for 6 weeks at low temperatures germinated, indicating that the seed coat must play a rôle in the longer dormancy of intact seeds. Dormant embryos placed on moist paper absorbed water very slowly as compared with afterripened embryos. Catalase activity increased as the period of afterripening advanced, but, since catalase increased also at temperatures unfavorable to germination, it could not be directly associated with the process. Peroxidase activity increased in the seed in a similar manner to catalase. Emulsin and amylase showed no apparent change in activity with afterripening and germination.

The influence of the water content of a gelatin membrane on osmotic transfer through the medium [trans. title], H. BOUYGUES (*Bul. Soc. Bot. France, 76 (1929), No. 3–4, pp. 311–314, figs. 2*).—Freedom of osmotic exchanges through a gelatine membrane is increased by increasing the water content of the constituent gelatin.

The effect of renewal of nutrient solutions upon the growth of culture plants and its relation to aeration, T. L. LOO (*Japan. Jour. Bot., 4 (1928), No. 1, pp. 71–98, figs. 5*).—The author has shown previously (E. S. R., 61, pp. 516, 627) that the H-ion concentration of the culture medium when in contact with roots of plants changes rapidly, and that this may seriously affect the plant growth. This effect can be avoided or lessened by adding phosphates or calcium chloride or by using a combination of two ammonium salts, as $(NH_4)_2SO_4$ and NH_4HCO_3, as a nitrogen source. A second method of preventing the harmful effect was adopted, namely, renewal of the nutrient solution, and results are described in the present article of experimentation in 1924 and 1926, with the daily change of pH in solutions renewed once daily, comparisons of the effect of the renewed and of the nonrenewed solutions upon plant growth, and the effect upon growth of aeration of the nutrient solutions.

It was found that the direction of the reaction change in the renewed solution series was the same as that in the nonrenewed solution series. In general, the reaction change was somewhat retarded by the renewals and the renewal plan produced better growth. Except in case of *Oryza sativa*, the yield increase was not so great in the solutions in which no considerable retardation of reaction change was secured by renewal (e. g., as in case of NH_4Cl and $(NH_4)_2SO_4$ cultures) as it was in the cultures kept at practically constant reaction. The renewal effect on paddy rice was different from that on wheat. In the case of the NH_4HCO_3 culture, no good renewal effect was obtained. Aeration of the nutrient solution had no effect on seedling growth, and oxygen may not, therefore, be a beneficial factor in the renewals.

Concentration of the nutrient medium versus its hydrogen-ion concentration as manifested by plant growth, A. ÅSLANDER (*Svensk Bot. Tidskr., 23 (1929), No. 1, pp. 96–140, figs. 6*).—Observations made in northern Sweden are said to have led to the view that plants commonly reputed to require neutrality or alkalinity in soils can grow very well in acid soils if they be of high fertility, and that a fertile soil requires a more concentrated soil solution than does an unfertile one. The present investigation bearing on these points included a determination of the H-ion concentration of common nutrient solutions, the making up of a neutral and of an acid solution, the growing of plants in these solutions and in dilutions of them, and a determination of soil reaction and the concentrations of water extracts of soils in the region in question.

It was found that most of the nutrient solutions commonly used are very acid, Knop's having a pH value of 3.65, but its usefulness shows that plants under certain circumstances can endure a high acidity. In the acid solution used (pH 3.75) barley plants (reputed to grow well only in a neutral soil) grew very well when full strength was used, whereas growth declined rapidly with dilution. The fact that this plant grew in the concentrated acid solution is taken to indicate that the salts counteracted in some way the injurious influence of the H ions. In the neutral solution (pH 6.75), dilution up to 40 times did not affect the plant's growth, this fact indicating that plants can grow in a very diluted solution when the reaction is around the neutral point.

About 60 per cent of the soil samples from the area in question were distinctly acid, showing pH values between 5.4 and 5.8.

Extracts of soils from recently and heavily manured fields were much more concentrated than were extracts of soil manured some years ago. The conclusion is reached that the more concentrated soil solution in recently manured fields is responsible for the invasion of these acid soils by plants which are claimed to grow only in neutral or alkaline soils. The acid nutrient solution in which barley grew well was more concentrated than any soil solution could be calculated to be. This higher concentration is supposed to make it possible for the plant to grow at a much lower pH value in a nutrient solution than that at which it occurs on farm land.

The author has concluded that the nature of the soil solution greatly affects the soil reaction at which plants thrive in nature, and at which our crop plants give optimum yields.

[Feeding of plants via the leaves with salts of potassium and of magnesium], M. K. DOMONTOVICH (DOMONTOWITSCH) and P. A. ZHELEZNOV (SCHELESNOW) (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 7 (1930), No. 2, pp. 134–143, figs. 6; Ger. abs., p. 143*).—In nearly all cases, notably favorable developmental results were obtained from plants which had been grown in potassium-free media if they were supplied, by painting the leaves, with potassium compounds, 2 or 3 per cent being the most favorable strength tested for

this purpose. Approximately as advantageous results were obtained by dipping the leaves in the salt solutions.

In similar use of magnesium salts, positive results were obtained, with obviation of the magnesium starvation chlorosis which otherwise tended to appear.

Comparative experiments achieving degrees of success with different compounds are detailed.

Relative effects of different iron salts upon growth and development of young rice plants, F. G. Gines (*Philippine Agr., 19 (1930), No. 1, pp. 43–52*).—In the present study, dealing with the growth and development of young rice plants in a standard culture solution which has received different iron salts separately in different amounts and also with the growth and development of the plants in different iron salts singly, it was found that all of the six iron salts used appear capable of supplying iron to young rice plants in complete culture solution. Ferric nitrate, ammonium ferric sulfate, and ferrous sulfate in complete culture medium tended to produce slender rice seedlings, though the plants were benefited by a range of from 13.34 to 133.4 or more parts per million of ferric chloride and of ferric nitrate.

The minimum beneficial amount of ferric phosphate for the plant was rather high, 33.35 parts per million, owing supposedly to the fact that this salt did not dissolve appreciably. The presence in large amount in complete culture solution each of ferric chloride, ferric nitrate, ferric phosphate, or ferrous sulfate did not appear to be harmful. Only a relatively small amount was sufficient to produce green plants in culture solution of potassium ferricyanide (1.65 parts per million), ammonium ferric sulfate (0.99 part per million), and ferrous sulfate (1.32 parts per million). Used singly and at a concentration of 0.0005 M, potassium ferricyanide, ammonium ferric sulfate, ferric chloride, ferrous sulfate, ferric nitrate, and ferric phosphate were toxic in the order of their naming to young rice plants; but at 0.00125 and 0.002 M, ferric nitrate was much more toxic than ferrous sulfate, the rest being toxic in the order above indicated. The toxicity of the iron salts to young rice plants was proportional directly to the concentration of the solution used, except that ferric phosphate gave no marked increase in toxicity with increased concentration of the solution.

The inorganic nutrition of the fungi.—I, The relation of calcium and boron to growth and spore formation, A. R. Davis, R. H. Marloth, and C. J. Bishop (*Phytopathology, 18 (1928), No. 11, p. 949*).—In view of the fact that information on the inorganic salt requirement of the fungi is meager, especially so as to elements needed in small amounts, and the further fact that C. P. chemicals used in nutrient media usually contain as contaminations sufficient amounts of many elements needed to supply the wants of the organism, the salts used in the present work were carefully recrystallized and purified. In the case of *Aspergillus niger* and *Penicillium italicum*, 50 cultures were grown on media made up of purified and unpurified salts with and without calcium. The resulting data were treated statistically.

In the case of each of the organisms, calcium was shown to increase yield quite definitely over the yield in media lacking calcium, and spore formation depended upon the presence of calcium. When *Dothiorella* sp. was employed as a test organism, the absence of boron in the medium decreased yields about one-half, and the use of 1.5 parts to a million restored yield to 90 per cent of that obtained with the unpurified salt. The evidence indicates that both calcium and boron are to be regarded as essential and not as stimulants in the older sense.

Edible and poisonous fungi ([*Gt. Brit.*] *Min. Agr. and Fisheries Bul. 23 (1930), pp. [5]+26, pls. 25*).—The present publication shows few further changes from the second, revised edition (E. S. R., 57, p. 437).

Plant material introduced by the Division of Foreign Plant Introduction, Bureau of Plant Industry, April 1 to June 30, 1930 (*U. S. Dept. Agr., Inventory 103 (1932), pp. 51*).—A total of 1,677 plants and seeds introduced into the United States for testing or for breeding purposes are listed and, in many cases, briefly described.

GENETICS

The genetical interpretation of statistics of the third degree in the study of quantitative inheritance, R. A. Fisher, F. R. Immer, and O. Tedin (*Genetics, 17 (1932), No. 2, pp. 107–124*).—This gives a genetical interpretation for certain second and third moment statistics which may be applied to studies of quantitative inheritance. Examples are selected from the tail ring number in mice, height in corn, and leaf length in lettuce.

Chromosome number in species of peanut, Arachis, L. Husted (*Amer. Nat., 65 (1931), No. 700, pp. 476, 477, fig. 1*).—In counts made at the Blandy Experiment Farm of the University of Virginia, the somatic chromosomes numbered 40 in each of six varieties of the commercial peanut (*A. hypogaea*) and a strain of the wild Brazilian species (*A. nambyquarae*).

The chromosomes of the domestic turkey, O. S. Werner (*Biol. Bul., 61 (1931), No. 2, pp. 157–164, figs. 12*).—A brief account is given of chromosome studies on the turkey in which the diploid number appeared to be 76 in the male and 77 in the female. The chromosome complex in the turkey is compared with that previously described for the duck, with general agreement in major points.

The relative yield of a first generation cross between two varieties of corn before and after selection, R. J. Garber and H. F. A. North (*Jour. Amer. Soc. Agron., 23 (1931), No. 8, pp. 647–651*).—In earlier work (1922 to 1924) at the West Virginia Experiment Station with F_1 crosses in corn (E. S. R., 55, p. 529), Clarage × Longfellow corn outyielded either of the parent varieties. When the two varieties were subjected to an ear-to-row test in 1927 to determine the higher yielding ears and when they were crossed, no increase in yield of the F_1 generation over the higher yielding parent (Clarage) was obtained in 1929 and 1930.

Inheritance of corolla colour in some Indian cottons, G. L. Kottur, B. B. Mundkur, and S. S. Maralihalli (*Indian Jour. Agr. Sci., 1 (1931), No. 5, pp. 577–585*).—When crosses were made between white- and red-flowered and yellow- and red-flowered cotton plants, the color of the corolla in the F_1 generation was red, although the intensity was not so great as that of the parent. In the yellow-flowered × red-flowered plants F_2 segregation was in the ratio of 3 : 1, while in the white-flowered × red-flowered plants it was on the basis of 9 : 3 : 3 : 1, and this was confirmed by the F_3 segregation. Harland's explanation (E. S. R., 65, p. 121) that yellow flower color is inherited on the basis of a 39 : 9 : 16 ratio involving three factor pairs did not seem to be tenable from the results here reported.

Inheritance of lint percentage in cotton, J. O. Ware (*Jour. Amer. Soc. Agron., 21 (1929), No. 9, pp. 876–894, figs. 5*).—The inheritance of lint percentage in cotton was studied in four sets of crosses made at the Arkansas Experiment Station, (A) Pima (30.98 per cent) × Winesap (31.91), (B) Pima (28.62) × Upright (36), (C) Winesap (30.69) × sea island (20.79), and (D) scant lint (5.55) × normal lint (34.31 per cent).

High lint percentage was shown to be incompletely dominant in the F_1 of the D crosses. In F_2 and in the progeny of the back-cross on the sparse-linted parent there was good evidence of a single factor control of lint percentage.

The F_1 generation mean of the C cross also held an intergrade position between the two parental means, but in the A and B crosses it lay, respectively, below both of its parental means. Hence, high lint percentage was incompletely dominant in the C and D crosses, and low lint percentage was intensified in the A and B crosses.

Inheritance of seed weight and lint index related to hereditability of lint percentage in cotton, J. O. WARE (*Jour. Amer. Soc. Agron., 23 (1931), No. 9, pp. 677–702, figs. 6*).—In order to analyze further the disagreeing features of lint percentage transmission as exhibited in the crosses noted above, weights of 100 seeds and lint index determinations were taken from plants used in the A, B, and C sets of crosses.

The low degree of lint percentage in the F_1 of the A and B crosses and the intergrade degree of lint percentage in the F_1 of the C cross appeared to be resultants of intensified seed weight in these conjugate populations and not a definite status of lint amount. The lint percentage was suppressed, not because of a decrease in lint yield but due to increase of seed weight through hybrid vigor. The parents of the A and B crosses were homozygous for seed weight as well as for lint index, but the parentage of the C cross, particularly the sea island, was not genetically pure for either character. Lint index showed no hybrid vigor in the A and B crosses and little if any in the C cross; consequently the closeness of the allelomorphic members for this character do not serve in tracing the transmission of heterosis. Hybrid vigor as expressed in the seed weight persisted in many of the sesquihybrids and F_2 plants. In general the three sets of crosses showed more variability in the lint index than they did in seed weight. In the sesquihybrids the mean of the seed weight tended to move toward the mean of the parental strain on which the back-cross was made. As to the lint index, there was less shifting of the sesquihybrids toward the parental strain upon which the back-cross was made than there was in seed weight.

The inheritance of characters in Setaria italica (Beauv.), the Italian millet.—Part I, Grain colours, G. N. R. AYYANGAR and T. R. NARAYANAN (*Indian Jour. Agr. Sci., 1 (1931), No. 5, pp. 586–608, pl. 1*).—Kernel colors noted in *S. italica* at the Millet Breeding Station at Coimbatore are grouped as (1) black, tawny buff, and korra buff, and (2) sepia, red, and tawny red. A factor *K* is present in group 1 and absent in group 2. In each of these groups the basic colors tawny red and korra buff, with the addition of a factor *I*, turn into red and tawny buff. This red and tawny buff with the addition of another factor *B* turn into sepia and black, respectively. The presence of *B* is not apparent except in association with *I*.

Natural crossing in oats [trans. title], H. WEXELSEN (*Nord. Jordbrugsforsk., 1931, No. 6–7 A, pp. 291–301; Eng. abs., p. 300*).—The percentage of black-grained plants found in white-grained lines of oats selected from populations derived from black × white crosses ranged from 0.25 to 5.86, and the amount of natural crossing was indicated as about double these values. With white and black grained plants grown in alternate rows 0.25 per cent of black-grained plants were found in white-grained rows in 1929 and 0.026 per cent in 1930.

The inheritance of characters in ragi, Eleusine coracana (Gaertn.), I–V (*Indian Jour. Agr. Sci., 1 (1931), Nos. 4, pp. 434–444, pls. 3; 5, pp. 538–576, pls. 8*).—Five contributions from the Agricultural Research Institute at Coimbatore are presented.

I. *Purple pigmentation*, G. N. R. Ayyangar and P. K. Rao (pp. 434–444).—Purple pigmentation in ragi, as in other cereals, is dominant to the unpigmented condition. Localized purple, in which purple is confined to the floral

parts, is considered the basic purple and designated *PP*, and green plants lacking purple pigmentation by *pp*. The purple factor is supplemented by intensifying factors I_1 and I_2. I_1 brings basic purple up to the dilute purple class, PPI_1I_1. I_2 acts only in the presence of I_1; with dilute purple it produces full pigment in the glumes and nodal bands and raises it to the purple class $PPI_1I_1I_2I_2$. The purple is prominent in many plant parts. I_2 in the absence of I_1 fails to affect the localized purple visibly beyond making it consist of the genetic groups $PPi_1i_1I_2I_2$ allelomorphic to purple and $PPi_1i_1i_2i_2$ allelomorphic to dilute purple. There are four groups of green plants which are the genetic recessive analogues of the four purple-pigmented genetic groups.

II. *Grain colour factors and their relation to plant purple pigmentation*, G. N. R. Ayyangar, P. K. Rao, and U. A. Wariar (pp. 538–553).—Ragi brown, the color characterizing the grain, can be produced by two factors B_1 and B_2 either alone or together. A third factor *S* with either or both of B_1 and B_2 produces plant purple pigmentation and accounts for the absence of white-grained ragi in purple-pigmented plants. *S* is carried by some white grain races. *D*, a factor intensifying the effect of B_1 and B_2, behaves as a simple dominant, is independent of factors concerned in plant purple pigmentation, and is not in selective association with B_1 or B_2.

III. *Sterility*, G. N. R. Ayyangar and N. Krishnaswami (pp. 554–562).—Chronic sterility, short of complete sterility, sometimes found in ragi, may be due to the nondehiscence of anthers or to the agglutination and consequent absence of free pollen. Normal dehiscence occurs with the presence of the *X* factor, and free pollen is produced by the *Y* factor. Both factors behave as simple dominants to their absence resulting in sterility.

IV. *Depth of green in the pericarp*, G. N. R. Ayyangar, P. K. Rao, and N. Krishnaswami (pp. 563–568).—While the pericarp of the developing ragi grain is usually green, minor races with a light green pericarp occur. In the absence of C_x, a factor responsible for the green of the pericarp, the pericarp is light green. C_x is independent of the *P*, *I*, and *B* factors. The tint of the dry anthers shows a differentiation in depth corresponding to the depth of green of the pericarp and is associated with it.

V. *Albinism*, G. N. R. Ayyangar and P. K. Rao (pp. 569–576).—The factors C_1 and C_2 either alone or together were found responsible for the production of chlorophyll in the ragi plant; in the absence of both the seedling turns white and dies. In the F_2 of crosses between plants with C_1 and C_2, segregation was 15 green to 1 albino. C_x noted above had no influence on C_1 or C_2.

Sex differences from the standpoint of biochemistry, Part I, T. Tadokoro (*Jour. Faculty Sci., Hokkaido Imp. Univ., Ser. III, 1 (1930), No. 1, pp. 9+IV+1–179, figs. 34*).—An account is given of the sex differences among various animals in fat, carbohydrate, and protein metabolism; physiology; enzymic activity; skeletal system; composition of muscle; animal pigments; and the action of vitamins.

Note on a sex-linked down character in ducks, R. C. Punnett (*Jour. Genetics, 25 (1932), No. 2, pp. 191–194, pl. 1*).—In crossing Mallard and Indian runner ducks it was found that the darker type of down of the Mallard behaved as a simple dominant sex-linked character. Reference is also made to other color types appearing in the F_2 generation; differences in carriage; and broodiness in the two breeds.

Inheritance in poultry, M. A. Jull and J. P. Quinn (*Jour. Heredity, 22 (1931), No. 5, pp. 147–154, figs. 5*).—The inheritance of three characters were studied in experiments by the U. S. D. A. Bureau of Animal Industry at Beltsville, Md. A male with vulture hocks from the F_2 generation of a Silkie-White

Leghorn cross was mated with Rhode Island Red females. The 202 F_2s produced were without vulture hocks, but in the F_2s 29 had vulture hocks and 82 did not show this character. The vulture hock characteristic seemed to be associated with leg-feathering, as all vulture-hocked birds had feathered legs but some with feathered legs did not have vulture hocks.

In another experiment the inheritance of hen-feathering was studied. A hen-feathered Brown Leghorn male was mated to Silver Penciled Plymouth Rock hens. The 75 male progeny showed considerable variation in the development of hen-feathering, which was considered to indicate the expression of modifying factors in addition to the single factor for hen-feathering. The variations in the expression of this character did not appear to be due to differences in the development of the testicles.

A condition in which the head was twisted to one side when birds were about half grown, and described as "crooked neck," was found to be inherited as a recessive to the normal. Such birds did not reproduce, as males were not able to mate and the females rarely laid any eggs, but matings of heterozygotes produced 129 normals and 27 "crooked-neck" progeny.

Color chimeras in the domestic fowl, C. W. Knox (*Jour. Heredity, 22 (1931), No. 4, pp. 133, 134, fig. 1*).—A fowl is described which had one green and one light yellow shank. It is suggested that this condition might have been produced by an unequal chromosome distribution or by gene mutation.

Correlation of hereditary and other factors affecting growth in guinea pigs, O. N. Eaton (*U. S. Dept. Agr., Tech. Bul. 279 (1932), pp. 36, figs. 15*).—From a study of the weights of 946 guinea pigs born in 5 inbred families and 113 noninbreds of the colony at Beltsville, Md., correlations were calculated between the weights and other factors, including the weight and age of the dam, litter rank, season of birth, length of gestation period, and size of litter.

The results showed that the age and weight of the dam influenced the variability in the birth weight about 12 per cent. while litter size and length of gestation determined more than 60 per cent of the variability in birth weight. Litter rank was an important factor influencing mortality. Early weights and gains were correlated with later weights, but the correlation decreased as maturity was approached. Gains from 3 to 13 days of age showed the highest correlations with later weights.

There was little correlation between the size of first litters and the size of subsequent litters, and between the size of young in first litters and the size of subsequent litters. Thus, first litters are a poor indication of subsequent breeding ability.

Germ gland transplantation, a new zootechnical method [trans. title], W. Polowzow (*Ztschr. Zücht., Reihe B. Tierzücht. u. Züchtungsbiol., 20 (1931), No. 2, pp. 281–292, figs. 10*).—Histories are given of transplantation experiments with testicles and overies on 6 dogs, 1 boar, 1 bull, 1 buck, and 7 sheep, in which regeneration of relatively old animals was successfully accomplished. The operation on the old animals increased the weight, appetite, sexual activity, and muscle and nerve tonus.

The benefits of the operations were noted within a few days and continued for variable periods up to three years in some animals under observation for that long. The position of the graft and other points with reference to the success of the operation are discussed.

The influence of transplantation of testicles according to the Voronoff method on body development and wool production in young sheep [trans. title], W. Polowzow (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 20 (1931), No. 2, pp. 264–280, fig. 1*).—The transplantation of testicles into 8-months-

old sheep had a favorable influence on wool growth, since the grafted sheep produced from 31 to 43 per cent more wool than controls and from 18 to 29 per cent more wool than wethers. The transplanted glands did not stimulate body growth, although castration retarded general growth.

The possible influence of various endocrine glands on the quality of wool is also discussed.

On the mechanism of ovulation in the rabbit.—III, The fate of mechanically ruptured follicles, M. H. FRIEDMAN (*Amer. Jour. Physiol., 98 (1931), No. 2, pp. 209–215, figs. 2*).—In continuing this series (E. S. R., 64, p. 128), it was found that the mechanical rupture of the large follicles in one ovary of 8 unmated rabbits did not lead to luteinization either in the injured follicles or in the follicles of the normal ovary, as had been reported by others.

In another experiment the follicles in one ovary of 10 rabbits were punctured within 30 minutes after coitus. Ovulation had occurred from the uninjured ovary in 2 of the rabbits sacrificed 48 hours later. Luteinization occurred in the punctured follicles of these animals, although the ova were retained. Luteinization and ovulation from the normal ovary occurred in all of 5 animals operated on from 2 to 3 hours after coitus. These results indicate that mere follicular rupture is not sufficient to cause the formation of lutein tissue.

Effects of X-rays on the development of the chick embryo, T. C. BYERLY and B. KNAPP, JR. (*Poultry Sci., 11 (1932), No. 2, pp. 98–101*).—Studies of the influence of X-radiation on fertilized eggs indicated that the treatment probably did not affect the incidence of chondrodystrophy, although the production of malformations was increased and there was a tendency to prevent hatching. The sex ratio was not altered.

FIELD CROPS

[Field crops investigations at the U. S. Field Station, Sacaton, Ariz., 1925–1930], C. J. KING and H. F. LOOMIS (*U. S. Dept. Agr. Circ. 206 (1932), pp. 10–12, 24–51, figs. 4*).—Experiments with field crops (E. S. R., 55, p. 433) reviewed again included variety trials with cotton, corn, barley, grain sorghum, sorgo, wheat, and alfalfa and breeding work with corn and barley. Besides an account of cotton production in the Salt River Valley brief reports are given on cotton investigations dealing with irrigation, spacing, planting, rotations, square shedding, flower production, and boll shedding, diurnal growth of plants, and the effect of alfalfa on the salt content of the soil and on growth and yields of cotton; physiological studies concerned with effects of temperature, of whitewashing the plants, and of early defloration; and research with Egyptian cotton having to do with improvement, crosses between Pima and Sakellaridis, inheritance, variation, and correlation of characters, pollination and fertilization, influence of the involucre leaves on the fruit, and physical and chemical properties of tissue fluids.

Biennial report of the Northeast Louisiana Experiment Station, St. Joseph, Louisiana, 1930–1931, C. B. HADDON (*Louisiana Stas., Northeast Louisiana Sta. Bien. Rpt. 1930–31, pp. 16*).—Experiments with field crops reported on for the period since 1929, when the station was established, included variety tests with cotton, corn, oats, alfalfa, and soybeans; fertilizer trials with cotton and corn; tests of cultural methods and winter cover crops for cotton; and comparison of smooth v. rough kernels of seed corn.

Report of the Holly Springs Branch Experiment Station, 1931, O. B. CASANOVA (*Mississippi Sta. Bul. 296 (1931), pp. 12*).—Field crops experiments (E. S. R., 65, p. 126) reported on for 1931, and in some phases for periods of several years, included variety tests with cotton and corn; tests of the relative

value of corn and sorghums for grain and silage; fertilizer trials with cotton, including comparisons of sources of nitrogen, phosphorus, and potassium; tests of winter cover crops for corn; crop rotations; and comparison of the effect of crop rotation v. continuous cotton upon soil fertility.

[Field crops experiments at the South Mississippi Substation, 1931], J. C. Robert, W. S. Anderson, and W. W. Welborne (*Mississippi Sta. Bul. 297 (1931), pp. 1–9, 13*).—Variety tests (E. S. R., 65, p. 31) with cotton, corn, sugarcane, soybeans, peanuts, and winter legumes; a fertilizer trial with corn; and studies of the effects on cotton wilt and yield of growing cotton after winter cover crops fertilized and untreated are reviewed for 1931. Fertilizer experiments with cotton dealt with carriers of nitrogen, potassium, and phosphorus and comparisons of high and low analysis, factory v. home mixed fertilizers, and of various formulas.

[Agronomic experiments in New Mexico] (*New Mexico Sta. Rpt. 1931, pp. 14–24, 27–31, 39, 40, 54, 55, 56, fig. 1*).—Experiments with field crops (E. S. R., 65, p. 221) reported on from the station and from outlying fields near Clayton, Capulin, Mosquero, Clovis, and Peralta comprised variety trials with winter and spring-sown wheat, oats, and barley, corn, grain sorghum, sorgo, cotton, alfalfa, soybeans, cowpeas, field beans, millet, and miscellaneous hay crops; breeding work and biometrical and genetic studies with cotton; cultural (including planting) tests with wheat, soybeans, cowpeas, and Sudan grass; fertilizer trials with cotton and alfalfa; irrigation tests with potatoes; studies of the annual production of sugar beet seed and of the curly top disease of sugar beets; investigation of factors affecting growth and germination of chamiza (*Atriplex canescens*), winter fat (*Eurotia lanata*), and *Valota saccharata;* trials of blue grama grass, slender wheat grass, crested wheat grass, smooth bromegrass, and other range plants; determinations of the protein content of samples of New Mexico wheat; and control of Johnson grass by chlorate sprays. Certain lines of work were in cooperation with the U. S. Department of Agriculture.

[Field crops experiments in Ohio] (*Ohio Sta. Bul. 497 (1932), pp. 21–27, 29–31, 32–45, 53, 66, 67, 86–88, 168, 169, 170–172, 175, 176, figs. 2*).—Agronomic research (E. S. R., 64, p. 623) for which results are reported was concerned with the quantity of fertilizer in the hill for corn, by R. M. Salter; the influence of fertilizers on the quality of corn, by J. S. Cutler; methods of cultivating corn, by H. L. Borst and G. M. McClure; tests of corn varieties and hybrids, by G. H. Stringfield; drought resistance of corn strains, by J. D. Sayre; the effects of soil type on wheat quality, by E. G. Bayfield; the reduction in germination of soybeans due to damage to seed coats during threshing, by J. B. Park; time of cutting clover, by C. J. Willard and J. B. McLaughlin; trials of perennial grasses for hay, by Willard; fertilizer experiments on farm pastures, by D. R. Dodd; comparison of nitrogen carriers for turf grasses, and the effects of soil reactions on lawn weeds, by F. A. Welton; the effects of clipping wheat in the spring, and crop rotations with and without wheat, by L. E. Thatcher; effects of the previous hay crop and of soil reaction on corn yields, by E. E. Barnes; the proportion of glucose and fructose in corn tissues, especially as affected by seasonal development, by V. H. Morris; control of Canada thistle and other perennial weeds with chlorate sprays, by H. A. Runnels; and fertilizers for main crop potatoes, period of maximum vigor of seed potatoes, the use of small potatoes for seed, and Irish Cobbler seed from various sources, by J. Bushnell.

Field crops at the county and regional experiment farms had to do with fertilizers for tobacco, by Cutler and H. M. Wachter; limestone on hay produc-

tion, by M. A. Bachtell and W. Mahan; fertility tests for corn, by Bachtell and H. W. Rogers; trials of winter barley strains, by Cutler and W. E. Weaver; comparison of wheat v. corn on poor corn land, by Bachtell and L. A. Malik; and the control of quack grass with chlorate sprays, by Willard and L. W. Sherman.

Several of the investigations were carried on in cooperation with the U. S. Department of Agriculture.

[Field crops work on the county experiment farms in Ohio, 1930] (*[Ohio Sta., Co. Expt. Farms Rpts.] 1930, Belmont Co. Farm, p. 4; Clermont Co. Farm, pp. 1, 2; Hamilton Co. Farm, pp. 4; Madison Co. Farm, p. 4; Miami Co. Farm, pp. 1–4; Paulding Co. Farm, pp. 4; Trumbull Co. Farm, pp. 4; Washington Co. Farm, pp. 1–3*).—Continued experiments with field crops (E. S. R., 63, p. 824) reported on for 1930 embraced variety tests with corn and oats; corn improvement work; planting tests with oats; fertilizer trials with corn, wheat, potatoes, and sugar beets; the effects of limestone on hay crops; trials of crop mixtures for hay; the relative feeding values of cereal crops; Sudan grass as summer pasture for dairy cows; comparisons of winter v. spring wheat and sweetclover v. true clover; the effect of drought on the yields of corn, wheat, hay, sweetclover, and other crops and on pasture; soil fertility studies; crop rotations; and the control of Canada thistle by chlorate sprays.

[Agronomic studies in South Dakota] (*South Dakota Sta. Rpt. 1931, pp. 12–14, 28*).—In research with field crops (E. S. R., 64, p. 626) data are reported from a study of carbohydrate variations in corn, determination of the water requirement of flax at different growth stages, effects of phosphorus on plant growth, soil fertility and depth of plowing studies, and crop rotations, Hansen Whiteseed alfalfa, a new hardy variety with white flowers and white seed, derived from a cross between *Medicago falcata* and Cossack alfalfa, is described briefly.

Agronomic work of the Big Spring, Tex., field station, 1915–1929, F. E. Keating (*U. S. Dept. Agr. Circ. 202 (1932), pp. 32, figs. 8*).—Rotation and tillage experiments and variety and planting tests reported on for the period 1915–1929 were made to determine the possibilities and best methods of crop production. Information is also given on the agriculture of the region, the soil, and the climatic conditions, including meteorological observations as to evaporation, precipitation, wind velocity, and temperature.

Cotton is indicated as the principal cash crop, milo for grain, sorgo and kafir for forage, feterita as a catch crop when late planting is necessary, Sudan grass for pasture, cowpeas as a legume hay, and peanuts for both nuts and hay. The low average yields of corn, wheat, beans, and millet did not warrant their production. Varietal leaders included Mebane, Lone Star, and Acala cotton, Dwarf Yellow milo, Reed kafir, Spur feterita, Sumac and Honey sorgo, Brabham, Iron, and Groit cowpeas for hay, and New Era cowpeas for seed.

Plowing or listing in fall and winter generally was better than spring plowing or listing. Cotton did not respond to fallow, and yields of other crops on summer fallow hardly exceeded those on land cropped in the preceding year enough to warrant extensive use of the method. Planting tests indicated for cotton May 15 to June 15 and from 12- to 24-in. spacings with 2 plants per hill, and for sorghum June 1 to 15 with 18-in. spacing for milo and 6-in. for kafir.

[Field crops research in Wyoming] (*Wyoming Sta. Rpt. 1931, pp. 8, 24, 25, 40–42, 43, 44, 45, 47, 48–51, 52, 53*).—Experiments (E. S. R., 65, p. 127) again reported on from the station and substations included variety trials with wheat, oats (E. S. R., 65, p. 731), barley, corn, flax, potatoes, soybeans, field beans,

alfalfa, sweetclover, millet, and miscellaneous forage grasses; tests of forage mixtures for pasture; analyses of range forage plants (E. S. R., 66, p. 425); cultural (including planting) trials with wheat, potatoes, alfalfa, and sugar beets; comparisons of dry land v. irrigated seed potatoes; fertilizer tests with oats and sugar beets; crop rotations; weed control studies; and a trial of safflower, a possible substitute for flax. Some phases of the work were in cooperation with the U. S. Department of Agriculture.

[Agronomic studies in England] (*Jour. Natl. Inst. Agr. Bot., 2 (1930), No. 4, pp. 313–392; 3 (1931), No. 1, pp. 5–126, figs. 11*).—Experimental activities with field crops reported on in these pages included trials of types of swedes and of mangels (1926–1928), variety trials with alfalfa (1925–1930), mangels (1929), and potatoes (1928–1930), and fertilizing of early potatoes, all by W. H. Parker; variety trials with sugar beets (1927–1930) and autumn-sown wheats (1928–1931), by S. F. Armstrong; tests of the quality of home-grown wheat varieties harvested in 1928 and 1929, by A. Humphries, J. P. Clover, and S. Humphries, and of the bread-making quality of wheats harvested in 1930, by A. and S. Humphries and L. H. Read; and Lord Derby Gold Medal potato trials (1930), by W. H. Parker and H. Bryan. The report of the Potato Synonym Committee (1930), by R. N. Salaman et al. is also included, and the methods employed in variety trials at the National Institute of Agricultural Botany are described by Parker.

Experiments with growing crop mixtures, J. W. THAYER, JR. (*Michigan Sta. Quart. Bul., 14 (1932), No. 3, pp. 162–167, fig. 1*).—Comparisons of a number of outstanding varieties of Michigan grains and legumes grown in combinations and separately showed the most digestible nutrients per acre to be produced by Wisconsin No. 38 barley, Wisconsin No. 38 barley and Wolverine oats, Spartan barley and Iogold oats, and Iogold oats. Certain crops, although yielding heavily in pounds per acre, actually produced less feed value than other crops yielding fewer pounds. The results indicated that it is comparatively easy to grow a mixture of crops that will outyield the same crops grown alone. Considering the small increases obtained from growing crops in mixture and the apparent disadvantages of the practice, it seemed advisable to await further tests under Michigan conditions before adopting the practice on a large scale.

Effects of sorghum residues on crop yields, A. D. MCKINLEY (*Jour. Amer. Soc. Agron., 23 (1931), No. 10, pp. 844–849*).—Marquis wheat was grown in pots at Iowa State College on soil receiving residues of milo, kafir, corn, wheat, and barley at the rate of 1.5 tons of dry matter per acre per 2,000,000 lbs. of soil, and corn and kafir tops at the rate of 3 tons per acre.

All treatments except the 3-ton applications caused increased yields over the checks. Ground kafir and corn tops made smaller yields than the chopped residues. Ground milo tops yielded slightly less than wheat or barley straw and considerably less than corn or kafir tops either ground or chopped. Yields were somewhat smaller after ground milo roots than with ground corn roots, but both were much lower than after kafir, wheat, and barley roots. Depressing effects of the 3 tons of corn and of kafir tops became evident a few weeks after planting and continued throughout the growth of the wheat. Plants receiving kafir tops were depressed most early in the experiment, but seemed to grow faster later on than in those pots which received the corn residues.

Indications were that sorghum residues under favorable conditions and not in excess of 2 tons per acre did not decrease crop yields on fertile soils but did actually help increase yields over untreated soils. Such increases might

be less than from corn or other types of residues. When excessively large quantities of organic matter with a wide N–C ratio are incorporated in the soil, depressing effects on crop growth become evident.

Effect of cutting and fertilizer applications on grass development, C. M. Harrison (*Plant Physiol., 6 (1931), No. 4, pp. 669–684, figs. 3*).—Experiments wherein clipping at different heights affected the quantity of roots produced by Kentucky bluegrass, red fescue, and colonial bent (*Agrostis capillaris*), were made at the University of Chicago. The quantity of roots produced was the smaller as the grass was cut shorter and the more the leaf area was reduced. Grasses with different growth characteristics responded differently to cutting, the fescue tillering more when cut short than when cut long, while the bluegrass produced fewer rhizomes. Fertilization with minerals did not compensate for lack of top growth in the production of roots. The killing of the grass appeared due to a gradual carbohydrate starvation to a point beyond which the plants could not maintain themselves rather than to a cutting off of the buds. Addition of nitrogen caused an increase in top growth but not in weight of roots over that of unfertilized grass.

The comparative protein content of alfalfa and red clover, C. J. Willard (*Jour. Amer. Soc. Agron., 23 (1931), No. 9, pp. 754–756*).—Comparisons by the Ohio Experiment Station between red clover and alfalfa sown at Columbus at the same time on the same soil type and harvested the same day showed similarity of the samples in protein content. As an average of 17 comparisons the percentage of crude protein in alfalfa was 16.7 and in red clover 16.6. The conclusion was that the commonly accepted and reported difference in protein content between red clover and alfalfa is due largely, if not entirely, to the fact that alfalfa usually is cut earlier in the season and at an earlier stage of maturity than red clover.

Alfalfa seed production studies in Michigan, E. E. Down (*Jour. Amer. Soc. Agron., 23 (1931), No. 12, pp. 983–999, figs. 10; abs. in Michigan Sta. Quart. Bul., 14 (1932), No. 3, p. 216*).—In studies of the influence of artificial tripping and of certain atmospheric factors in the production of alfalfa seed it was observed that in 1928, 45.1 per cent of the artificially tripped flowers produced pods and flowers developing normally 15.8 per cent. In 1929 the respective percentages were 56.1 and 12.2. In both seasons the artificially tripped flowers produced more seed per pod. Conditions appeared more favorable at midday than at either 9 or 5 o'clock to tripping and to processes influencing pod setting. Pod production by artificially tripped flowers varied materially according to the time of day of tripping, the percentage usually increasing as the day advanced until 11 o'clock, decreasing until 3 o'clock, and then increasing again. Lack of tripping was considered to be one of the chief factors limiting alfalfa seed production in Michigan during 1928 and 1929.

Effect of fertilizers and date of planting on the physiological development of the corn plant, R. W. Gerdel (*Plant Physiol., 6 (1931), No. 4, pp. 695–714, figs. 12*).—Measurements of the physiological development of the corn plant were made periodically on Burr-Leaming corn grown at the Ohio Experiment Station in 1926, 1927, and 1928 on plats representing 19 different degrees of fertility and two different dates of planting.

Continuous abundance of nitrogen, phosphorus, and potassium throughout the season was accompanied by marked differentiation of the vegetative and reproductive cycles associated with a narrow silking range, early silking, and high yield, while with a low supply of these elements throughout the season overlapping and emergence of the two growth cycles occurred, together with a wide silking range, late silking, and low yield. Application of fertilizer in the

hill seemed to intensify the differentiation of the vegetative and reproductive cycles, whereas broadcasting was markedly less effective, presumably because less nutrients were available to the plant during its early growth period. The maximum leaf area, stalk diameter, and plant height, and also the narrowest silking range and earliest average silking date occurred at fertility levels considerably below that which still produced increase in yield. The degree of soil fertility at which the different physiological maxima were obtained was about the same from year to year, regardless of annual fluctuation in maxima due to seasonal conditions.

Breeding European corn borer resistant corn, A. R. Marston (*Jour. Amer. Soc. Agron., 23 (1931), No. 12, pp. 960–964, figs. 2; abs. in Michigan Sta. Quart. Bul., 14 (1932), No. 3, pp. 215, 216*).—Continued tests (E. S. R., 64, p. 363) of crosses between Maize Amargo, a late maturing corn from South America proving resistant to European corn borer, and native Michigan varieties are reported. Strains from crosses involving Maize Amargo had fewer borers per 100 corn plants, more plats without borers, and decidedly fewer plats with two or more borers present than crosses between Michigan corn varieties inbred for as many generations. That the late maturity of Maize Amargo is not the reason for its resistance to the corn borer was indicated by the fact that crosses of other equally late maturing and unadapted varieties with native Michigan varieties lack resistance and resemble local corn crosses in their reaction to borer attack.

Reports [on cotton investigations] received from experiment stations, 1930–1931 (*London: Empire Cotton Growing Corp., 1932, pp. XI+242, pls. 3, figs. 46*).—The progress of research with cotton (E. S. R., 65, p. 34), rotation crops, and control of cotton insects and diseases conducted under the auspices of or by officials connected with the Empire Cotton Growing Corporation is reported on from Biloela, Queensland; Barberton, South Africa; Bremersdorp and Ingwavuma, Swaziland; Gatooma, Southern Rhodesia; Mazabuka, Northern Rhodesia; Shambat and elsewhere in Anglo-Egyptian Sudan; Bukalasa and Serere, Uganda; Makwapala, Port Herald, and Domira Bay, Nyasaland, Daudawa, Nigeria; Rustam, Iraq; St. Vincent, British West Indies; and Sigatoka, Fiji.

The shedding of 4-lock and 5-lock bolls in Upland cotton, R. E. Beckett and J. W. Hubbard (*U. S. Dept. Agr., Tech. Bul. 277 (1932), pp. 16, figs. 9*).—Studies made with Lone Star cotton at Greenville, Tex., in 1925 and with Acala cotton at Bard, Calif., in 1926 and 1927 showed that 5-lock bolls may have a greater tendency to abort than 4-lock bolls. The data obtained under favorable and unfavorable conditions demonstrated that under adverse conditions a lower percentage of 5-lock bolls are produced and a higher percentage are shed.

Fertilizer experiments with seed and fiber flax in Chippewa County, B. B. Robinson and A. G. Weidemann (*Mich. Sta. Quart. Bul., 14 (1932), No. 3, pp. 158–161*).—Linota seed flax and Saginaw fiber flax were grown in cooperation with the U. S. D. A. Fiber Investigations during 1928, 1930, and 1931 on heavy clay of the Ontonagon type variously fertilized and limed and manured. The fertilizers increased the yields of unthreshed and threshed straw but usually did not noticeably increase the yields of seed. More fiber was also obtained with certain fertilizer applications, as of 2-16-4, 4-16-4, and 0-16-4 formulas to the fiber flax. The response to superphosphate alone was not encouraging, being less than the checks. Manure with superphosphate outyielded superphosphate alone but not noticeably more than the check plats. Manure alone resulted in 4.13 bu. more seed from the seed flax, the largest increase over no treatment. The increases of seed obtained by the use of fertilizers

were larger from seed flax than from fiber flax. Yields of either type were not affected appreciably by lime. High analysis fertilizers, as 4–16–4 and 6–16–4, usually resulted in yields consistently exceeding those of the checks. While the 4–16–4 fertilizer seemed to show the best results with seed flax on this soil, its use is suggested on crops responding more favorably to fertilizer and to follow them with flax so that it may use the residual nutrients. The yields of straw from fiber flax increased with the applications of commercial fertilizers, but the maximum gain averaged only 509 and 513 lbs. of unthreshed and threshed straw, respectively. The quality of fiber was judged below the average of European or Canadian fiber, being very strong, coarse, and harsh and lacking in spinning quality.

Quantity determinations of seed for rod rows of spring oats, C. K. McClelland (*Jour. Amer. Soc. Agron., 23 (1931), No. 9, pp. 702–708*).—A study of the relative merits of weighing or measuring the seed for individual nursery rows was undertaken at the Arkansas Experiment Station.

The weights of measured fine, medium, and coarse oats averaged, respectively, 13.1, 13.2, and 12.6 g per measure (porcelain crucible 26 to 27 cm³ capacity) equivalent to about 2.4 bu. per acre or nearly the standard rate of seeding, 10 pk., and the counts averaged, respectively, 754, 584, and 516 seeds per measure. Similar counts on seeds of 10 sorts of spring oats showed only an allowable variation within a variety or even between the varieties. The averages varied from 520 in Fulghum to 684 per measure in Iogren. In a test of rate of seeding of the fine, medium, and coarse seeded oats, rates of 400 or more seeds per rod row gave the better yields. The number of heads per row was related closely to the number of grams per row, but neither apparently was so closely related with the number of seeds used. Results with counted (400), weighed (11 g), and measured (26 to 27 cm³) seeds of Fulghum oats favored the measured oats slightly. With 10 varieties no difference of note existed in number of heads or yield in grams per row as between methods of weighing or measuring the seed, except that with Elite measuring gave the poorer results. Evidently for the varieties tested the seed might as well be measured as weighed.

Markton oats need no treatment for smut, H. C. Rather, E. E. Down, and G. F. Wenner (*Michigan Sta. Quart. Bul., 14 (1932), No. 3, pp. 193–198, figs. 2*).—Markton oats compares with Wolverine oats in production and quality of grain and is highly resistant to smut but lodges worse than Wolverine. Markton is indicated for the lighter soils of the lower peninsula on which oats seldom lodge, and Wolverine for good upland soils outside of northern areas where stem rust often is serious.

Irrigating potatoes with a porous canvas hose, O. E. Robey (*Michigan Sta. Quart. Bul., 14 (1932), No. 3, pp. 142–146, figs. 4*).—Potatoes irrigated by means of a porous canvas hose during the dry summer of 1931—from 4 to 7 in. were applied in weekly applications equivalent to 1 in. of rain commencing August 1—gave substantial increase in acre yields, especially in No. 1 tubers.

Seedling color and yield of sugar beets, S. B. Nuckols (*Jour. Amer. Soc. Agron., 23 (1931), No. 9, pp. 740–743*).—Some color pigment of either red or yellow is most distinct in the hypocotyl of small sugar beet plants during the first four weeks of growth but also is readily discernible in the small leaf buds of mature plants. The color of the young hypocotyl was found the same as in the mature leaf buds. Color of plant did not seem to be correlated with either yield or sugar content in the varieties studied.

Production of new varieties of sugarcane and experimental results [trans. title], P. Richardson Kuntz (*Puerto Rico Dept. Agr. and Com. Sta. Bul.

38 (1931), Spanish ed., pp. 67, figs. 9).—The development of varieties of sugarcane by the station and other agencies on the island is reviewed, and the origin, characteristics, resistance to diseases and pests, and other data on P. R. 803 and F. C. 916, canes derived from the crossing of S. C. 12/4 with P. O. J. 2725, are discussed in some detail. The comparative germination, cane yields, sugar production, and analyses of juice of a number of varieties are reported on, with precipitation data, from tests in different localities in Porto Rico, and the results of spacing tests with B. H. 10/12, S. C. 12/4, P. O. J. 2878, and F. C. 916 are summarized.

Results of seed and legume inoculant inspection, 1931, J. G. FISKE (*New Jersey Stas. Bul. 535 (1932), pp. 93*).—The purity, germination percentage, and other information are tabulated for 1,461 official samples of seed of field crops, vegetables, and lawn mixtures obtained from dealers in New Jersey in 1931, and the crops, inoculation and purity, number of organisms, and viability are given for 54 official samples of legume inoculants.

Toxicity of sodium nitrate for a species of moss, A. B. BEAUMONT (*Science, 75 (1932), No. 1942, pp. 312, 313*).—The toxicity of sodium nitrate and potassium nitrate for *Polytrichum commune*, a species of moss common on run-out upland pastures of the New England States, seemed in Massachusetts Experiment Station studies to be due primarily to the sodium and potassium ions. However, the cationic effect appeared to be linked somewhat with the anionic effect, for usually the nitrates were more toxic than the corresponding chlorides.

HORTICULTURE

[Horticulture at the Sacaton, Ariz., field station], C. J. KING and H. F. LOOMIS (*U. S. Dept. Agr. Circ. 206 (1932), pp. 51–61, figs. 7*).—In this progress report (E. S. R., 55, p. 438) information is presented on the comparative susceptibility of various fruits to the nematode *Caconema radicicola*, on the culture of various citrus fruits, including grapefruit, oranges, and lemons, and on the culture of dates, pecans, grapes, muskmelons, lettuce, white potatoes, and miscellaneous other vegetables.

[Horticulture at the South Mississippi Substation], J. C. ROBERT, W. S. ANDERSON, and W. W. WELBORNE (*Mississippi Sta. Bul. 297 (1931), pp. 9–12, 13*).—The results are presented of variety, pruning, and cultural tests with peaches, pecans, grapes, figs, brambles, citrus fruits, watermelons, and roses, and of fertilizer tests with snap beans, Irish potatoes, and tomatoes.

[Horticulture at the New Mexico Station] (*New Mexico Sta. Rpt. 1931, pp. 38, 39, 46–52, 53, 56–63, figs. 3*).—In this progress report (E. S. R., 65, p. 227) results are presented of determinations of the arsenic present in spray residue on apples; of phenological and variety tests with fruits and nuts; of smudging experiments for protecting fruits from low temperatures; of cultural experiments with tomatoes and onions; of fertilizer tests with cabbage and onions; and of miscellaneous experiments with sweet peas, ornamentals, and watermelons.

[Horticulture at the Ohio Station] (*Ohio Sta. Bul. 497 (1932), pp. 88–94, 95–107, figs. 5*).—Included in this report are results of tests of celery fertilizers, by D. Comin; potted v. trowel-set tomatoes and on the reinoculation of sterilized greenhouse soils by manures, by I. C. Hoffman; an orchard survey, by J. H. Gourley; an analysis of the ash of apple fruits, by [E. F.] Hopkins and Gourley; a new apple, Ohio Seedling No. 73, and the amounts of dust required by apple trees, by C. W. Ellenwood; fruit setting, pollination, chromosomal aberrations in megasporogenesis in the apple, and pear culture

experiments, by F. S. Howlett; the early thinning of overloaded peach trees, the effect of fertilizer on currants, and the cost of producing black raspberries, by J. S. Shoemaker; the starting of flower seeds, thinning of sweet peas, and relation between diameter of corms and growth of gladiolus, by [W. W.] Wiggin; photoperiodic response of plants to reduction of light, the effect of fertilizers on greenhouse plants, washed sand as a substitute for soil in the culture of greenhouse crops, peat mulches, stimulation of rooting in cuttings by chemicals, and effect of defoliation on the rooting of softwood cuttings, by A. Laurie.

[Horticultural investigations, 1930] (*[Ohio Sta., Co. Expt. Farms Rpts.] 1930, Clermont Co. Farm, pp. 2–4; Mahoning Co. Farm, pp. 4*).—Data are presented from the Clermont County Farm on the need of prompt removal of apple fillers and on the results of cultural and fertilizer trials with apples. At the Mahoning County Farm spray and dusts for apples were compared, various spray materials tested, and an effective means of using large overgrown tomato plants was developed.

[Horticulture at the South Dakota Station] (*South Dakota Sta. Rpt. 1931, pp. 27, 28, 29, 30*).—Notes are presented on certain seedlings, namely, a crab apple, a plum, and a black currant, developed by the station, and on observations gleaned in a survey of fruit breeding activities in Europe and at various institutions in eastern North America.

Analyses of materials sold as insecticides and fungicides during 1931, C. S. Cathcart and R. L. Willis (*New Jersey Stas. Bul. 530 (1931), pp. 16*).—The results are presented of analyses of various insecticides and fungicides collected during the 1931 inspection (E. S. R., 65, p. 40).

Vegetable growing, K. Reichelt and N. Nicolaisen (*Die Praxis des Gemusebaues. Berlin: Paul Parey, 1931, pp. VIII+274, figs. [168]*).—A text and handbook designed for instruction and practical use.

Fertilizer experiments with ten market-garden crops in Cook County, Illinois, J. W. Lloyd and E. P. Lewis (*Illinois Sta. Bul. 377 (1932), pp. 36, figs. 16*).—In presenting the results of fertilizer studies with beans, beets, carrots, cauliflower, lettuce, peas, peppers, potatoes, spinach, and tomatoes carried on over a 5-year period, the authors show that the difficulty resulting from the scarcity and high price of animal manures may be overcome effectively by supplementing smaller applications of manure with commercial fertilizer; in fact, when one-half of the manure was replaced by fertilizer the yields were even higher than with large applications of stable manure alone. With the majority of the ten crops satisfactory yields were secured when the entire amount of manure was replaced by commercial fertilizer. In the absence of manure complete fertilizer was more effective than incomplete, yet where 10 tons of manure were used superphosphate was fully as effective as complete fertilizer with the exception of beets, cauliflower, peas, and spinach. Under the conditions of the experiment nitrogen alone was not a profitable fertilizer. Limestone increased the yields of most of the crops, significantly in the case of beets, carrots, lettuce, potatoes, and spinach.

The relative response to fertilizers of cabbage, tomatoes, cucumbers, and sweet corn, J. Bushnell (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 516–519*).—Based on results obtained in long continued vegetable rotation experiments at the Washington County Experiment Farm, the Ohio Experiment Station reports that cabbage responded effectively to large applications, 1,880 lbs. per acre, of 4–10–4 fertilizer, whereas cucumbers, tomatoes, and sweet corn gave less yields than with 1,220 lbs. of the fertilizer. The omission of nitrogen from the fertilizer was evident in the first crop, except with tomatoes. Phos-

phoric acid deficiency decreased yields in all crops from the very first, but continued applications of superphosphate depressed the yield of sweet corn below that of the phosphorus-deficient plants. With both nitrogen and phosphorus, cucumbers gave the greatest response of any of the four crops. Phosphorus used as a supplement to manure was of little or no benefit, apparently due to the unusually high phosphorus content of the soil. Tomatoes required a relatively high phosphoric acid content in the soil, although cucumbers were most sensitive to phosphorus deficiency. Because of the high potassium content of the soil none of the crops responded to applications of this material.

Inter-relation between soil reaction and growth of lettuce, carrots, beets, and beans, H. H. ZIMMERLEY (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 509–515*).—Investigations started in 1927 at the Virginia Truck Experiment Station upon the effects of phosphorus on the growth of lettuce, beets, carrots, and snap beans grown on soils of different pH reactions showed rather wide ranges in the optimum pH for each of the species. In lettuce the optima pH values for four crops lay between 5.7 and 7.1, with beets between 5.8 and 7.2, with carrots 5.3 to 6.6, and beans 5.3 to 6.

Lettuce grew very slowly in soils as acid as pH 4.9 and 5, many plants dying in the seedling stage. Similar results were obtained with beets and carrots at the same pH values, whereas snap beans proved more tolerant of acid conditions, yielding fair crops at the same pH point.

Regenerative capacities of leaf and leaflet cuttings of tomato and of leaf and shoot cuttings of potato, C. L. ISBELL (*Bot. Gaz., 92 (1931), No. 2, pp. 192–201, figs. 23*).—In studies at the Alabama Experiment Station it was found that leaf and leaflet cuttings of the tomato rooted readily but that only the leaf cutting would form shoots. Stem cuttings of the white potato converted one of the axillary buds into a tuber, tuber and roots, or a tuber in combination with a shoot and roots. In some cases roots were produced directly from the base of the cutting. Potato leaf cuttings with axillary buds converted the axillary bud into either a shoot or a tuber.

Soil preparation and fertilizers for tomatoes, R. L. COOK (*Michigan Sta. Quart. Bul., 14 (1932), No. 3, pp. 171–183, figs. 2*).—Yield records presented largely in tabular form show that it was impossible to grow profitable crops of tomatoes on Berrien sand without fertilizer. Not less than 500 lbs. of 4–16–8 were required to insure satisfactory yields. Experiments in 1929 on a heavy soil in a high state of fertility showed the need of only phosphorus and potash, and in the extremely dry season of 1930 no fertilizer appeared to be of any value. In tests on both light and heavy soils fertilizers hastened the maturity of tomatoes and thereby materially increased returns. Where tomatoes are grown for market the results indicated the advisability of placing part of the fertilizer near the plant rather than broadcasting. Total yields were not significantly increased by hill fertilizing, but maturity was decidedly hastened.

Seedling differences in the pome family [trans. title], D. CASELLA (*Ann. R. Ist. Super. Agr. Portici, 3. ser., 4 (1931), pp. 157–165, pls. 9*).—Detailed studies of seedlings of several species, such as pear, apple, Japanese quince, and hawthorn, showed that in the pome family not only the seed but the young seedlings present well marked characteristic differences. Within a species varieties were quite similar. The conclusion is reached that young seedlings should be given greater consideration in the identification of species.

The relationship between soil profile and root development of fruit trees, N. L. PARTRIDGE and J. O. VEATCH (*Michigan Sta. Quart. Bul., 14 (1932), No. 3, pp. 200–207, figs. 2*).—A discussion is presented of the relation between the type of soil and the root growth of fruit trees. When trees were grown in

a friable sandy loam or a light loam most of the roots were found in the upper 1.5 to 2 ft. of soil, and whether in sod or in tillage the densest root development was about 6 to 8 in. below the surface. Roots were found to a depth of 20 ft. or more, apparently in search of water.

On difficult soils the most common factor preventing deep root penetration was poor drainage, with a very deep pervious layer of dry sand or a highly compact and poorly aerated subsoil also serving as obstacles. The age of the tree influenced its welfare on any given soil; for example, the roots of older trees were often able to reach more favorable soil. Ecologically the soils of southwestern Michigan are said to be divided into those whose profile prevents the development of a deep root system and those which permit the roots to reach the moist subsoil. Soils of the first group may sometimes be improved by deep tillage or dynamiting. Well drained soils with a penetrable clayey subsoil and a good supply of humus in the surface layer are deemed most satisfactory for fruit growing.

Spraying program and pest control in the orchard (*Ohio Sta. Bul. 500 (1932), pp. 49, figs 13*).—A general discussion presenting spray programs for the control of fruit insects and diseases, with comments on the preparation of spray materials and upon spraying and dusting procedure. Supplemental notes are presented on troubles such as fire blight, peach borer, and rodent injury not controlled by spraying.

[Spray schedules for New Jersey fruits] (*New Jersey Stas. Circs. 252 (1932), pp. 4; 253, pp. 3; 254, pp. 8; 255, pp. 4; 256, pp. 2*).—Entitled, respectively, 1932 Spray Schedule for Peaches, 1932 Spray Schedule for Pears, 1932 Spraying Recommendations for Apples, 1932 Spray Schedule for Plums and Cherries, and 1932 Spray Schedule for Grapes, these pamphlets, all by T. J. Headlee, W. H. Martin, and A. J. Farley, present up-to-date information on the control of various insect and fungus pests.

Stomatal activity in apple leaves, J. R. Magness and J. R. Furr (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 207–211, fig. 1*).—Using a portable microscope, examinations were made by the U. S. Department of Agriculture of dry untreated strips of the lower epidermis of apple leaves and the percentage and degree of opening of the stomata recorded. Checking these observations with those on attached leaves there was found no consistent difference due to the stripping process.

Stomata opened in the apple shortly after daylight and usually were fully open within one-half hour after sunrise. The duration of the open period was largely determined by moisture conditions in the soil and air; for example, on July 27, 1930, when the soil of nonirrigated plats was reduced to the wilting coefficient in the upper 2-ft. zone, there was almost no opening of stomata, whereas in adjacent irrigated plats approximately 100 per cent of the stomata were open in early morning and 40 per cent at noon. There was little variation in stomatal behavior in leaves from different portions of a single tree. The presence of fruit tended to keep stomata open longer, due apparently to the greater need of the products of photosynthesis; hence the accumulation of such products as well as moisture supply is thought to be concerned with stomatal movement. Observations on the stomata are believed to be of value in studies of the effect of various treatments on the available water supply.

Preliminary report on relation of soil moisture to stomatal activity and fruit growth of apples, J. R. Furr and J. R. Magness (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 212–218, figs. 2*).—That the apple tree responds to inadequate soil moisture by reducing the stomatal activity of the leaves was indicated in studies conducted in western Maryland by the U. S. Department of

Agriculture in the dry summer of 1930 with irrigated and nonirrigated Rome and Duchess apple trees growing in a rather shallow stony soil. The length of time that stomata remained open was regulated by the amount of soil moisture and the evaporating power of the air; for example, during a period of extremely high temperature and low humidity stomata of the irrigated trees were open from 4.5 to 6.5 hours, while during a subsequent cool showery period they remained open from 8 to 11 hours. During the first two weeks of July the stomata of the irrigated trees remained open approximately twice as long as did those of the dry plats. There was in general a close correlation between the open stomata period and the growth rate of the fruits. Apparently as zones of greatest root concentration reached the wilting percentage, the tree adjusted itself by closing the stomata earlier each day.

Seasonal distribution of reducase in the various organs of an apple tree, S. H. ECKERSON (*Contrib. Boyce Thompson Inst., 3 (1931), No. 3, pp. 405–412, figs. 4*).—Supplied with material (Stark apple) at weekly intervals throughout the year by the New Jersey Experiment Stations, the author working at the Boyce Thompson Institute found that during most of the year the ability of apple trees to reduce nitrate was located chiefly in the fine roots, the principal exception being in early spring when reducase was high in both roots and swelling buds. The march of nitrate reduction activity through the year was as follows: The lowest point (zero) occurred during the five weeks following flowering; reduction was low in summer, followed by a rise in late summer and early fall to a high stage lasting from late fall until late winter; and this in turn was followed by a sharp decline in February, with a rapid rise to a maximum in early spring. Reducase in the buds was always accompanied by reducase in the adjacent bark. Very little reducase was present in the leaves at any time.

Recommend two new apples for special markets, W. TOENJES (*Michigan Sta. Quart. Bul., 14 (1932), No. 3, pp. 198, 199*).—Lodi and Milton, two apple seedlings developed at the New York State Experiment Station, are described and discussed as to value.

Fruit sterility with special reference to the cherry [trans. title], P. BRANSCHEIDT (*Gartenbauwissenschaft, 4 (1931), No. 5, pp. 387–427, figs. 2*).—The following cherries, Weinkirsche, Nägelschers Kirsche, Freinsheimer Schlosskirsche, Freinsheimer frühe Schwarze, Lambsheimer Kruzstiel, Bankhardtskirsche, Mitteldicke Haumüller, and Dicke Haumüller, were found completely self-unfruitful. The varieties Mohrenkirsche and Napoleonskirsche yielded 15.4 and 33.3 per cent of fruit, respectively, upon artificial self-pollination. Some indication was evident that late-blooming cherries tend to be more self-fruitful than early-blooming varieties. Various combinations proved to be intersterile and others interfruitful, and as a result of the tests desirable pollinators are suggested for the above-mentioned varieties. Cellophane sacks were found very undesirable for covering flower clusters, markedly reducing the percentage of set as compared with that under paper sacks, a result thought due perhaps to the impermeability of the cellophane to water.

New peach recommended for limited plantings, S. JOHNSTON (*Michigan Sta. Quart. Bul., 14 (1932), No. 3, pp. 199, 200*).—Halehaven, a peach resulting from a cross between J. H. Hale and South Haven is described and discussed.

The "New Logan" black raspberry, S. JOHNSTON (*Michigan Sta. Quart. Bul., 14 (1932), No. 3, p. 162*).—The plant is said to be remarkably free from virus troubles and to yield fruit of excellent quality.

Effects of height of pruning on size of berries and yield in the Latham raspberry, W. G. BRIERLEY (*Minnesota Sta. Bul. 281 (1931), pp. 20, figs. 6*).—

Under conditions favorable to growth, such as occurred in 1929, the yields of Latham raspberries increased in proportion to the length of the canes, the computed yields per acre for that year for canes 36, 42, 48, 54, and 60 in. in length being, respectively, 90.4, 118, 139.9, 154.7, and 160.8 crates. The berries from the shorter canes were larger, due in part to the pruning and in part to the fact that the lower portion of the canes consistently produced larger berries. However, the increased size of berries was not sufficient to offset the general decreased yield due to the removal of a part of the cane. Long-pruned (60-in.) canes tended to blossom and mature their fruit a few days earlier than did shorter canes, and conversely short-pruned canes tended to produce slightly more fruit in the later pickings than did long canes.

As concerned the effect of pruning on growth, there was noted a tendency for laterals to grow more vigorously as the severity of the pruning was increased. Various complicating factors, such as immaturity of the cane, winter injury, drought, and high temperature, also materially affected yields. Hence, the author points out that various managemental practices, such as the duration of the cultivation period, the planting of cover crops, and mulching, are often quite as important in red raspberry production as is pruning. Extreme pruning, to a 15-in. height, was tested in 1928 but was found too severe, the increased berry size being not at all sufficient to make up for the very heavy loss in crop volume.

Notes on the nutrient requirements and the histology of the cranberry (Vaccinium macrocarpon Ait.), with special reference to mycorrhiza, R. H. Addoms and F. C. Mounce (*Plant Physiol., 6 (1931), No. 4, pp. 653–668, pls. 2, figs. 3*).—Observations at the New Jersey Experiment Stations on Early Black cranberry plants grown in quartz sand cultures in the greenhouse showed a vigorous growth, exceeding, except in the no-nitrogen lots, that of comparable bog plants. Plants of the ammonium series produced noticeably greater runner growth than those of the nitrate series; in fact, low concentrations of nitrate were more effective than high concentrations in promoting growth.

Mycorrhiza found present in all cultures were least in the minus-nitrogen series, a fact which when associated with the small growth of this series suggests that the nitrogen fixation properties of mycorrhiza, if existent, were altogether inadequate. Mycelia were found in the stems, fruits, and seeds, the hyphae penetrating the epidermis and cortical parenchyma. Oil and glycogen were found in the fungus, but nitrates could not be detected in the plant or fungus at any time.

Seedling form in the citrus family [trans. title], D. Casella (*Ann. R. Ist. Super. Agr. Portici, 3. ser., 4 (1931), pp. 166–175, pls. 15*).—With abundant illustrations, this paper presents descriptive data on the seed, seedlings, and leaves of various important species of citrus.

A study on the salt requirements of coco-seedlings grown in pots, G. R. Briones (*Philippine Agr., 20 (1931), No. 5, pp. 352–361*).—The addition of ammonium sulfate to a three-salt culture solution increased the rate of growth of the leaves and increased the fresh weight of tops and roots of coco seedlings growing in soil cultures. Coco seedlings were found to be tolerant to rather heavy applications of magnesium sulfate. The rate of absorption of culture solutions by single roots was found a fair indication of the nutritive value of such solutions for the coco palm.

The origin of adventitious roots in cuttings of Portulaca oleracea L., M. H. Connard and P. W. Zimmerman (*Contrib. Boyce Thompson Inst., 3 (1931), No. 3, pp. 337–346, pls. 2, fig. 1*).—Using cuttings collected in the gardens

of the Boyce Thompson Institute and grown in sand or water, the authors found that the majority of adventitious roots arise in the medullary rays within 5 mm of the base and emerge through the cut surface without penetrating the epidermis. The earliest meristematic activity occurred in the interfascicular cambium, cells derived from these divisions forming the inner portions of the root and accessory vascular tissues of the stem. The pericycle generally formed the outer portion of the root, the endodermis being the first tissue dissolved by the root. Cases were observed in which the roots were fully differentiated and some tissues already dissolved while the endodermis was still intact. Primordia were observed within vascular bundles where the pericycle could not have functioned in their formation. Under certain conditions roots originated within the pith.

FORESTRY

The principal laws relating to the establishment and administration of the national forests and to other Forest Service activities (*U. S. Dept. Agr., Misc. Pub. 135 (1932), pp. 31*).—Herein is presented a compilation, in most cases in the exact wording of the original statutes, of legislation relating to national forestry.

[Forestry at the Ohio Station] (*Ohio Sta. Bul. 497 (1932), pp. 177–193, figs. 4*).—A general administrative report concerning activities in the purchase of forest lands is given by O. A. Alderman and E. Secrest; on planting, by Secrest; on the control of forest fires, by B. E. Leete; on forestry legislation, by F. W. Dean; and on natural forest regeneration, by E. G. Wiesehuegel. Measurements by R. R. Paton on five species of pine growing in the Wooster Forest showed the Corsican pine to have made the most rapid annual height growth.

Improvement of woodlands, W. E. Hiley (*London: Country Life, Ltd., 1931, pp. VIII+250, pls. 15, figs. 5*).—A general discussion in which are considered among other items choice of species, establishment of nurseries and plantations, thinning, harvesting the crop, and general management.

Alcohol separation of empty seed and its effect on the germination of red spruce, H. I. Baldwin (*Amer. Jour. Bot., 19 (1932), No. 1, pp. 1–11, figs. 3*).—In work completed at Yale University the author found that by immersing *Picea rubra* seeds in absolute alcohol for one or two minutes it was possible to remove all the empty seeds by simple flotation. Seeds which had been so treated germinated more promptly and completely than untreated seeds, if dried and tested at once, but declined in viability if held. Catalase activity increased immediately after the alcoholic treatment, but declined to one-half that of untreated seed after 20 days. In the light of the results the author asserts that the dipping of imported red spruce seed in colored alcoholic solutions for identification purposes is a questionable practice.

An instance of "damping-off" retarded by the use of basic slag, W. G. Gray (*Forestry, 5 (1931), No. 2, pp. 132–135*).—Basic slag worked into the top 3 in. of soil at the rate of 2 lbs. 6 oz. per square yard greatly reduced the losses from damping-off in seed beds of Scots pine, Corsican pine, *Pinus contorta*, European larch, and Sitka spruce growing in the Imperial Forestry Institute nursery at Kennington, Oxford, England. Sulfate of potash had some beneficial effect, but much less than that of the slag.

Pinus insignis in northern Spain [trans. title], D. Ignacio Echeverria and D. Simeón de Prado (*Inst. Forest. Invest. y Exper. [Madrid], 4 (1931), No. 9, pp. 45, figs. 19*).—Information is presented on the rate of growth, methods of growing, and pulp-producing capacities of this species.

Deterioration of Christmas holly in transit and storage, R. C. WRIGHT and T. M. WHITEMAN (*U. S. Dept. Agr. Circ. 207 (1931), pp. 12, pl. 1, figs. 2*).—Briefly discussing the preparation and shipping of holly, the authors state that trouble sometimes occurs from discoloring of the leaves, accompanied in extreme cases by dropping. A series of experiments carried on in 1928, 1929, and 1930 to determine the causes of discoloration led to the conclusion that freezing in itself is not the primary cause, but discoloration is due to the condensation of moisture on cold leaves changed from a low to a high temperature while still confined within the package. An improved method of packing is suggested which allows the circulation of air.

Observations on boxed lots or wreaths frozen and then stored at 40° and 50° F. showed the accumulation of moisture followed by subsequent discoloration. Holly sprinkled with water before storing at 50° discolored more quickly than did holly stored dry under like conditions. Holly berries did not discolor unless mechanically injured. The average freezing point for holly leaves was 26.3°.

DISEASES OF PLANTS

Studies in the genus Cercospora. (1) Morbid anatomy. (2) Changes undergone by four different species of Cercospora when grown on four different culture media, U. B. SINGH (*Indian Sci. Cong. Proc. [Calcutta], 17 (1930), p. 285.*)—A comparative study was made of four species of Cercospora, forms of which are reputed to cause leaf spotting in plants. The fungus is said to be hemiparasitic, both intercellular and intracellular in habit. The length in both conidiophores and conidia is variable, depending somewhat on humidity. Details are given regarding the comparative results of culture study, dealing chiefly with macroscopic and microscopic characters, rate of radial advance, spore measurement, and septation mode.

Effect of environmental factors on the growth of certain species and strains of Helminthosporium, M. MITRA (*Indian Sci. Cong. Proc. [Calcutta], 17 (1930), pp. 282, 283*).—A study applied to seven species or strains of Helminthosporium on cultivated grasses and one on ginger is said to show that the rate of growth depends on several factors, as type and amount of medium and presence or absence of light, though certain strains, as that from ginger, have only a slow rate under all conditions tested. Temperature effect depends somewhat on the medium. Differentiation also appears as regards the position of growth temperature optima and maxima and as regards sensitiveness to heating. The macroscopic growth features vary considerably. The microscopic growth features show greater constancy. Sporulation quantity and measurements vary considerably. Spore shape and color are markedly constant and so valuable for classification.

Saltation in the genus Helminthosporium, M. MITRA (*Indian Sci. Cong. Proc. [Calcutta], 17 (1930), p. 283*).—Of 8 species or forms of Helminthosporium isolated from natural sources, all except 1 from wheat and 1 from Panicum produced saltants in artificial culture, 48 saltants in all having been isolated and studied.

New strains may show as sectors, more often in the shallower plates, but more frequently saltants arise as scattered patches. Such areas may or may not present a visible differentiation. They are more frequent in the cultures which are older, in those on rich media, or in those maintained at or near the optimum temperature for growth.

Comparisons between parents and derived saltants show macroscopic characters to be extremely variable, therefore of little taxonomic value. Much

variation appears as regards spore size and septation, though most resemble the parent forms in these respects. Spore shape and color are fairly constant.

According to a preliminary test, a considerable range as regards parasitic vigor exists among the various saltants of *H. sativum*.

Nectria canker.—I, Infection [trans. title], O. MORITZ (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 40 (1930), No. 5, pp. 251–261*).—In this introductory part of a study of canker associated with *Nectria* spp., it was sought to find by analytical methods the chemical or perhaps physical principle conditioning the pathogenicity of a causal organism. It is stated that the virulence of 22 Nectrias differed extraordinarily from trunk to trunk, so that no definite dependence upon species could be made out. Possibly a general cell-injuring agent is present. Resistance may be merely quickness of regeneration. Infection of unwounded parts occurred only with trees cultivated under very moist cultural conditions.

Study of epidemic plant diseases on the basis of work on animal carriers [trans. title], H. BLUNCK (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 39 (1929), No. 1, pp. 1–28*).—This account, said to have been based on a statement rendered in November, 1928, includes a bibliography of about 175 titles.

[**Plant pathology at the New Mexico Station**] (*New Mexico Sta. Rpt. 1931, pp. 31, 32, 34, 36, 37, 55*).—Information is presented on the effect of irrigation on the occurrence of a wilt disease and the control of blight in the chili pepper, on the occurrence of apple measles and its manner of spread, on the control of chlorosis in plants, and on the control of certain potato diseases such as mosaic and possibly western yellow blight.

[**Plant pathology at the Ohio Station**] (*Ohio Sta. Bul. 497 (1932), pp. 54–66, 68, 69, 95, figs. 3*).—In this report there is included information on the control of apple scab, by H. C. Young; on the control of Brooks' spot disease of the apple, by Young and H. F. Winter; on gladiolus corm treatment, control of damping-off of flower seedlings, and proportion of lime needed in Bordeaux mixture used for spraying potatoes, all by P. E. Tilford; on the relative toxicity of cucumber treatments, and on evaporation and drought at Wooster, both by J. D. Wilson; on the influence of spray materials on plant water loss, and the results of ginseng spraying experiments, both by Wilson and H. A. Runnels; on the causes and control of damping-off of tomato seedlings, and the control of powdery mildew and red spider of greenhouse cucumbers, both by L. J. Alexander and Young; upon the influence of soil temperature and soil moisture on the development of Verticillium wilt of tomatoes, and the control of tomato leaf mold in greenhouses, both by Alexander; on raspberry crown gall control, and raspberry virus disease control, both by Winter; on the structure of the Pythiaceae, and a comparative phenol coefficient study, both by R. C. Thomas.

Some progress was recorded by C. May in experiments conducted cooperatively with the U. S. Department of Agriculture on the nature and control of the Dutch elm disease, and the susceptibility of certain varieties of apples to root rot is discussed by C. W. Ellenwood.

A dangerous neighbor for wheat, oats, barley, and rye, D. G. FLETCHER (*U. S. Dept. Agr., Misc. Pub. 131 (1931), folder, figs. 6*).—The life history of the black stem rust is discussed and depicted in color, with suggestions for control by the eradication of the alternate host, the common barberry.

Adaptation of quick steeping treatments [trans. title], F. ZIMMERMANN (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 39 (1929), No. 6, pp. 209–224*).—Tabulation and discussion are presented of experimentation with different strengths of various fungicides for quick, effective, and relatively inexpensive steeping of seed grains. It is thought that the plan of rapid steeping affords a

procedure having the advantages without the disadvantages of dry seed treatments, at lowered costs.

The action of Uspulun on seed, I, II [trans. title], A. NIETHAMMER (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 39 (1929), Nos. 3, pp. 120–122; 10–11, pp. 389–392*).—The first section of this account deals with the disinfecting capabilities of an Uspulun preparation; the second, with its stimulating qualities.

Experimentation in control of rice dry speck [trans. title], I. TUTEFF (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 38 (1928), No. 9–10, pp. 279–284*).—An account is given regarding a study of rice dry speck at the Sadovo, Bulgaria, Experiment Station. It is concluded that the seed steeping preparation Kalimat B is a many-sided and effective disinfectant, giving, moreover, a stimulating effect on the plantlets which showed both during growth and in the grain.

Anthracnose of chilli (Capsicum annuum) due to Colletotrichum nigrum E. and Halls, H. L. GULATI (*Indian Sci. Cong. Proc. [Calcutta], 17 (1930), p. 281*).—Characters are described of *C. nigrum* attacking the chili (*Capsicum annuum*) under both natural and artificial conditions. Fruits are badly anthracnosed, and fruitstalks and sometimes twigs are attacked.

Inoculations with pure cultures of the fungus isolated from the chili have produced rot in fruits of the tomato and the chili and in leaves and twigs of *Ficus elastica*, Citrus species, and leaves and stem of the sweet pea.

Light, which is inhibitory to the growth of the fungus, is essential to the formation of acervuli. Culture zonation results from alternation of day and night during growth. The optimum growth temperature appears to be between 27° and 29° C.

[Cotton disease investigations at the Sacaton, Ariz., field station], C. J. KING and H. F. LOOMIS (*U. S. Dept. Agr. Circ. 206 (1932), pp. 13–24, figs. 4*).—The results are given of studies upon the use of barnyard manure, of clean fallow, and of various mechanical barriers in reducing injury from cotton root rot (*Phymatotrichum omnivorum*), upon the viability of root rot sclerotia, upon the effect of crazy top (acromania), upon boll shedding of unshaded and shaded cotton plants, upon the occurrence and control of root knot (*Caconema radicicola*) in cotton, and on the occurrence and control of the sore shin disease (*Corticium vagum*).

Verticillium wilt (Hadromycosis) of cotton in the San Joaquin Valley of California, F. W. HERBERT and J. W. HUBBARD (*U. S. Dept. Agr. Circ. 211 (1932), pp. 8, figs. 3*).—A wilt disease of cotton, caused by the soil fungus *Verticillium alboatrum* and first observed in 1927, is described with relation to symptoms, effects on various varieties of cotton, and its difference from Fusarium wilt. Possible sources of infection and the possibility of control are briefly outlined.

The control of bottom rot of lettuce, G. R. TOWNSEND and A. G. NEWHALL (*New York Cornell Sta. Bul. 535 (1932), pp. 11, figs. 7*).—Bottom rot caused by the fungus *Rhizoctonia solani* is a disease of the mature lettuce head. All varieties of head lettuce are susceptible, although the Cos, Romaine, and Iceberg varieties usually escape because of their upright habit of growth. The disease was found particularly severe on infested soils when the mean temperature was above 67° F. and the air humid. Very satisfactory control was obtained by one application about two weeks before maturity of an ethyl mercury phosphate dust. When properly applied, one treatment of from 20 to 25 lbs. per acre gave almost complete protection. Traction dusters developed especially for this treatment are briefly described.

Collar and stem canker of (Cajanus indicus) pigeon pea caused by a species of Physalospora, R. LEACH and J. WRIGHT (*Mem. Imp. Col. Trop. Agr., Trinidad, Mycol. Ser. No. 1 (1930), pp. 4, pls. 8*).—Symptoms are detailed of a stem and collar canker, common in Trinidad, of pigeon pea (*C. indicus*). The parasitic organism is an ascomycete suggested to be a Physalospora. A description is given of the perithecial and the pycnidial stages, as of various cultural characteristics, and the connection between the various forms has been established.

Tobacco seed bed management as related to wildfire control, W. S. BEACH (*Pennsylvania Sta. Bul. 274 (1932), pp. 23, figs. 12*).—Based on the results of extensive experiments conducted in cooperation with the U. S. Department of Agriculture, cultural recommendations are presented for the growing of tobacco plants with a view to eliminating or reducing the hazard from wildfire (*Bacterium tabacum*). Among suggestions presented are that the seed beds should be placed from 300 to 400 ft. away from barns or other places where tobacco refuse might be present, and that if the seed bed showed infection the preceding year a new selection should be chosen. Boards, sash, and other equipment should be sterilized with formaldehyde. Seed should be obtained if possible from disease-free fields, and all doubtful seed should be treated with silver nitrate. Insects should be excluded from the beds, and as an added precaution the beds should be sprayed at weekly intervals with Bordeaux mixture or dusted with copper-lime. Calomel was found as effective as Bordeaux mixture. Small areas of infection in the beds may be cleared up by drenching with strong formaldehyde.

The cultural study of two fungi found in an Indian hill apple, J. H. MITTER and R. N. TANDON (*Indian Sci. Cong. Proc. [Calcutta], 17 (1930), pp. 283, 284*).—A soft rot from a hill apple, studied on Brown's starch medium, gave distinct fungi, which were designated as A and B, differentiating as to morphology and growth rate. The fungus A, the weaker as a parasite, did not sporulate. B produced pycnidia submerged in the medium and is thought to belong to Sphaeropsis, a genus not previously reported as on apples in India.

Causation of apoplexy in apricots [trans. title], L. RIVES (*Rev. Vitic., 70 (1929), No. 1805, pp. 73–76*).—It is estimated that during a recent period of six years half of the apricot trees in the Rhône Valley have died, a large part of this mortality being due to so-called apricot apoplexy, especially in the area between Lyon and Valence. The nature and causation of the trouble are discussed, with references to recent related literature. The dimensions of the bacillus, the form of the cultures, and the odor of the fruits suggest the disease known as blight in the United States and attributed to *Bacillus amylovorus*.

Coryneum blight injures Michigan peaches, D. CATION (*Michigan Sta. Quart. Bul., 14 (1932), No. 3, pp. 131–136, figs. 4*).—Asserting that *C. beijerinckii*, usually thought of minor importance in Michigan, has caused considerable injury in recent years, the author describes the symptoms of the disease, discusses the comparative susceptibility of varieties, and outlines methods of control. A single fall application of Bordeaux mixture gave almost perfect commercial control, whereas a spring application of 1–10 lime-sulfur had little value.

The rôle of phosphoric acid in poverty diseases [trans. title], P. VIALA (*Rev. Vitic., 71 (1929), No. 1847, pp. 325, 326*).—Noting a general deterioration with frequent premature mortality of plum trees in certain areas, said to have been carefully studied by G. Guittonneau with the collaboration of J. Keilling and Bejambes, the present author states that the features due to parasitic organisms are easy to determine and have been found to be comparatively

insignificant as regards the mortality, the true cause allegedly being of a physiological sort and due to a deficiency in nutrition, specifically correlated with lack of assimilable phosphorus. The soil of the area in which the mortality of the plum trees is constant, when used to plate cultures of Azotobacter, gives slight or no development of that organism as contrasted with soils giving good growth of plum trees, comparable to that obtained by addition of phosphoric acid. Chemical analyses of the soils confirm the results of microbiological analyses. The predominant rôle, for plum trees, of assimilable phosphoric acid is said to have been clearly evidenced by this work.

Investigations on the black root of strawberries, F. C. and M. C. STRONG (*Phytopathology, 21 (1931), No. 11, pp. 1041–1060, figs. 6; abs. in Michigan Sta. Quart. Bul., 14 (1932), No. 3, p. 215*).—Stating that the disease is widespread in Michigan and is also reported from many other localities, the authors describe the symptoms of the disease and discuss its cause and control. The outstanding symptoms are stunting and wilting of the plants, often occurring during the picking season, so that plants die while carrying green fruit. The roots of the diseased plants are black and corky in texture. Many of the lateral roots are rotted off, which reduces the ability of the plant to obtain water and nutrients. Evidence was obtained that black root is an infectious disease, transmissible from one plant to another, and is caused by two common fungi, *Hainesia lythri* and *Coniothyrium fuckelii*. Since investigators in other States have found other soil fungi associated with the disease, the authors conclude that black root may be caused by several soil fungi. Various chemical disinfectants were found unsuccessful, and the only control measures suggested are those which keep the plants in a good growing condition, and also a rotation of crops.

On the occurrence of Acrothecium n. sp. on grape vine, in the Government College Botanic Gardens, Lahore, H. CHAUDHURI (*Indian Sci. Cong. Proc. [Calcutta], 17 (1930), p. 280*).—In February, 1929, an Acrothecium, supposedly a new species though not named, was isolated locally from grape leaves, on which it caused rapidly spreading spots, and from twigs, on which it caused brownish patches, the fruits apparently not being infected. Cultural studies were continued.

Court-noué, P. MARSAIS (*Rev. Vitic., 70 (1929), No. 1801, pp. 5–7, pl. 1*).—Variously termed locally, the grapevine morphological anomaly somewhat commonly designated as court-noué and characterized outwardly by a shortening of the internodes, is discussed as appearing on certain varieties. The trouble may be physiological in its nature, a disorder of nutrition.

Summer treatments for grape mildew [trans. title], H. ASTRUC (*Rev. Vitic., 71 (1929), No. 1831, pp. 73–76*).—Small equal areas given, respectively, no treatment, seven copper sprayings, and five sprayings with four dustings, yielded in the proportions of approximately 5, 12, and 20.

On a disease of Citrus malta caused by Verticillium tubercularioides Speg., H. CHAUDHURI (*Indian Sci. Cong. Proc. [Calcutta], 17 (1930), p. 280*).—From a twig of *C. malta* showing symptoms of withertip (*Colletotrichum gloeosporioides*) was isolated *V. tubercularioides*, which was found to grow on a variety of media at fairly high temperatures, though it disappeared under natural conditions with the moderate rise of temperature in the early summer. The fungus from the culture could infect only very young twigs in the early spring and then only by way of wounds.

Wither-tip disease of the citrus plants in the Punjab, H. CHAUDHURI and G. SINGH (*Indian Sci. Cong. Proc. [Calcutta], 17 (1930), pp. 280, 281*).—Citrus plant withertip (*Colletotrichum gloeosporioides*), said to cause much damage in the Punjab, severely attacked trees showing lowered vitality, lessened produc-

tion, and occasioned heavy loss due to the casting of the fruit while very young.

A study of the characters of the fungus under natural environment and in culture shows the fungus to be capable of living from year to year in dead tissues, and to spread most readily under moist conditions. The authors have concluded, as the result of studies, that *C. gloeosporioides* is a polymorphic species made up of strains morphologically similar though physiologically different. Each is affected by its environment, both spore size and growth characteristics being varied according to the growth medium.

Citrus diseases in Belgian Congo (trans. title), P. STANER (*Bul. Agr. Congo Belge, 20 (1929), No. 3, pp. 364–373, figs. 7*).—Diseases of citrus plants in Belgian Congo, as listed with brief discussion and appropriate treatments, include gummosis (*Pythiacystis citrophthora*), scab (*Sporotrichum citri* or *Sphaceloma fawcetti*), anthracnose (*Colletotrichum gloeosporioides* or *Gloeosporium limetticolum*), three fruit rots (*Penicillium italicum*, *P. digitatum*, and *Pythiacystis citrophthora*), smut (*Capnodium citri*), red rust (*Cephaleuros virescens*), and chlorosis (physiological). The phanerogamic parasite mistletoe (*Loranthus* sp.) and a few insect pests are also noted.

Wilt diseases of coconut palms in Trinidad, Part II, H. R. BRITON-JONES (*Trop. Agr. [Trinidad], Sup., Dec., 1929, pp. 12, pls. 2, figs. 5*).—Asserting support of views expressed in part 1 (E. S. R., 63, p. 50), the author states that the present part does not conclude the showing as to bronze leaf wilt of coconut palms in Trinidad. The study has already given ground for definite conclusions regarding the future of coconut cultivations in localities showing the disease.

Late evidence indicates that bronze leaf wilt is caused by a combination of factors, including that of soil moisture, itself largely dependent upon tilth, texture, and humus, as well as by adverse agricultural operations. The situation on several estates is serious.

Control of the American leaf disease (Omphalia flavida) on Arabian coffee in Trinidad, H. R. BRITON-JONES (*Mem. Imp. Col. Trop. Agr., Trinidad, Mycol. Ser. No. 2 (1930), pp. 8*).—The author's observations on the distribution of the coffee leaf disease caused by *O. flavida* have led him to agree with the views of Nowell (E. S. R., 55, p. 540), that the occurrence and progress of this trouble depend on humid conditions, so that it is found most abundantly in the (wetter) hill districts. The present author also stresses the observed importance of high atmospheric humidity rather than that of high rainfall. Persistent heavy blankets of mist in pocket-like situations are associated with abrupt change from nondiseased to diseased areas. Spreading of the disease in Trinidad does not show in general a faster rate than that estimated for Puerto Rico by Nowell as 200 yds. per year, and in some cases it may be much slower.

A briefly detailed account is given of local conditions, of spraying against defoliation, of field experimentation, and of the general principles of berry production in view of the possibilities of disease. Suggestions are made involving varietal resistance, also temporary lessening of shade in affected areas.

Wither-tip disease of jasmine caused by Diplodia jasmini West, H. CHAUDHURI (*Indian Sci. Cong. Proc. [Calcutta], 17 (1930), pp. 279, 280*).—Withertip disease of jasmine was observed for the four years previous to this report in Golbag, Lahore, causing considerable injury, which is described, during the formation of new twigs in the spring. It overwinters under the bark on the dried twigs and is dispersed on the peeling of the bark. Proper control depends on the adequate removal of the dead twig parts. The fungus grows readily in culture and saltates freely in certain media.

The host range of Loranthus europaeus and its extension to Castanea vesca [trans. title] [C.] VON TUBEUF (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 39 (1929), No. 3, pp. 113–120, figs. 3*).—This account deals with geographical and climatic relations in connection with the extension of *L. europaeus*, ordinarily parasitic only on *Quercus* spp., to *C. vesca*.

Observations on cypre (Cordia alliodora L.) in Trinidad, with special reference to canker disease (Puccinia cordiae (P. Henn.) Arthur), I, II (*Mem. Imp. Col. Trop. Agr., Trinidad, Mycol. Ser. No. 3 (1930), pp. 8, pls. 2*).—The main object of the work reported in part 1, by H. R. Briton-Jones, was to ascertain whether the control, under forest conditions, of *P. cordiae*, the cause of the canker disease of cypre, is possible. This condensed presentation covers the historical review and accounts regarding the host, the fungus, the disease (cankers), and control measures. Part 2, by R. C. Marshall, deals with the distribution, habitat, and silvicultural characters of *C. alliodora* and the cypre canker and its control from the forestry standpoint.

The distribution of the disease, which causes its most severe damage through the cankers which are permanent on the main trunk of the tree, is correlated with high atmospheric humidity. The critical period for cypre as a crop is the early part of its life unless it is in a very sheltered, humid locality where it is only after some years subjected to the drying sun and breeze. Spacing and early exposure to sunshine are important.

P. cordiae attacks healthy young living tissue. It is essential to plant the host in airy, open spaces, avoiding sheltered, humid hollows. The tree stands exposure well. Early thinning is indicated, but undergrowths should be controlled.

Elm disease and its cause [trans. title], M. J. F. WILSON (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 39 (1929), No. 1, pp. 36–39*).—Following up some of the work and reports of Brussoff (E. S. R., 58, pp. 154, 252; 60, p. 354; 61, p. 349), the author found *Fagus sylvatica* to develop symptoms of infection after artificial inoculation with *Micrococcus ulmi*, while *Ulmus campestris*, *U. montana*, *Tilia europaea*, *Acer pseudoplatanus*, *Quercus pedunculata*, *Populus nigra*, *Crataegus oxyacantha*, *Salix alba*, *Prunus cerasus*, and *Amygdalus communis* remained absolutely unaffected.

Blister rust control through biological means [trans. title] [C.] VON TUBEUF (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 40 (1930), No. 4, pp. 177–181*).—The author has previously indicated (E. S. R., 31, p. 451; 66, p. 844) some possibilities of checking the development of white pine blister rust (*Peridermium strobi* (*Cronartium ribicolum*)) through the activity of the superparasite *Tuberculina maxima*. The present account deals further with the values and susceptibilities of the various European conifers.

[Spike disease of sandal] (*Indian Sci. Cong. Proc.* [*Calcutta*], *17 (1930), pp. 303, 305, 313*).—The following articles are here noted: Contribution to the Study of Spike Disease of Sandal (*Santalum album* Linn).—Nitrogen Metabolism in Healthy and Spiked Sandal, and Proteolytic Activity in Healthy and Spiked Sandal, both by N. Narasimhamurty (p. 303); Chemical Study of the Buds of Spiked and Healthy Sandals and Oxidases in Healthy and Spiked Tissues of Sandal, both by B. N. Sastri (p. 305); and Infectivity of Various Tissues of "Spiked" Sandal and Studies in the Resistance of Sandal to "Spike" Disease, Part I, both by M. Sreenivasaya (p. 313).

Presence and proof of oxidases in connection with wood-destroying fungi [trans. title], W. BAVENDAMM (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 38 (1928), No. 9–10, pp. 257–276, figs. 9*).—The wood-destroying fungi with which tests for oxidases were made in certain phases regarding which methods of

work are given and resulting information is tabulated, with discussion, include in the main *Merulius lacrymans*, *Coniophora cerebella*, *Polyporus sulphureus*, *Nectria cinnabarina*, and *N. galligena*.

ECONOMIC ZOOLOGY—ENTOMOLOGY

The brown and the black rat in Wales, C. Matheson (*Cardiff: Natl. Mus. Wales, 1931, pp. VII+46, pls. 5, fig. 1*).—The several chapters of this work deal with the classification and description of British rats, a historical account and discussion of the present status of the brown rat (*Rattus norvegicus*) and the black rat (*R. rattus*) in Wales, the damage done by rodents in Wales, rats as carriers of disease in Wales, and methods of prevention and destruction. Notes on the sex ratio in *R. norvegicus*, a report on the numbers of each subspecies of the black rat and of brown rats from the Cardiff Port sanitary area examined during the years 1922 to 1929, inclusive, and the seasonal incidence of flea infestation among ship rats at Cardiff appear in appendixes. A bibliography of 23 titles and an index are included.

The sylvids and flycatchers of New Jersey, L. A. Hausman (*New Jersey Stas. Bul. 531 (1931), pp. 32, figs. 32*).—This, the fourth in the series reporting upon studies of the birds of New Jersey (E. S. R., 65, p. 448), takes up the flycatchers, of the family Tyrannidae, including nine forms, namely, the great-crested flycatcher, kingbird, olive-sided flycatcher, phoebe, wood pewee, alder flycatcher, Acadian flycatcher, yellow-bellied flycatcher, and least flycatcher. A description of both sexes, with notes on their habits, including a chart show ing the dietary, the arrangement of which as relates to insects being by orders, is given for each of the nine forms. A chart comparative of the dietaries of the native flycatchers and one of the foods consumed are included. Then follow a field key to the native flycatchers and a similar account of the sylvids, of the family Sylviidae, of which the ruby-crowned kinglet, golden-crowned kinglet, and blue-gray gnat catcher are noted .

The relative importance of amphibians, reptiles, birds, and mammals as hosts for chiggers and other ectoparasites, H. E. Ewing (*Ann. Ent. Soc Amer., 24 (1931), No. 4, pp. 746–750, fig. 1*).—This report deals primarily with the relative abundance of the ectoparasites, upon four of the five classes of vertebrates, namely, the amphibians, reptiles, birds, and mammals, during the spring, summer, and fall months in the Atlantic States from Maryland to Florida. Amphibians are shown for the first time to be hosts of major importance as far as the mites are concerned. The relatively unimportant part played by mammals as hosts for chiggers in this section of the country is indicated.

Some problems in economic entomology, J. S. Houser (*Jour. Econ. Ent., 25 (1932), No. 1, pp. 28–37*).—A general discussion.

[Notes on economic insects and their control] (*Jour. Econ. Ent., 25 (1932), No. 1, pp. 134–145*).—The contributions relating to economic insects here presented (E. S. R., 66, p. 647) are as follows: Another Spider Becomes a Greenhouse Pest [*Eperigone tridentata* Emerton], by C. R. Crosby (p. 134); The Colorado Potato Beetle in Utah, by G. F. Knowlton (p. 134); An Addition to the Biology of *Rhopalosiphum prunifoliae* (Fitch), by C. R. Cutright (p. 134); Notes on a New Potato Pest [*Gnorimoschema tuberosella* Busck], by R. E. Barrett (p. 134); Chemically Treated Bands Destructive to Spider Mites and the Woolly Aphis, by M. A. Yothers (p. 135); The Apparent Incompatibility of Barium Fluosilicate and Nicotine Sulphate, by F. S. Chamberlin (p. 135); Mesquite Injured by *Orthotylus translucens* Tucker in Arizona, by W. W.

Jones (p. 136); Hibernation of 13-Spotted Lady Beetle [*Hippodamia tredecimpunctata* L.], by W. A. Thomas (p. 136); Comparative Effectiveness of Fall and Spring Applications of Paradichlorobenzene for Peach Borer Control, by O. I. Snapp and J. R. Thomson (pp. 136, 137); A Commercial Use for a Destructive Insect [Thyridopteryx], by C. A. Clark (p. 137); The Potato Pin Worm, *Gnorimoschema lycopersicella* Busck, a New Pest in Pennsylvania, by C. A. Thomas (pp. 137, 138); Ethylene Oxide-Liquid Carbon Dioxide Mixture in House Fumigation, by H. H. Shepard and D. L. Lindgren (pp. 138, 139); A Peculiar Spotting of Oranges in Central California, by E. A. McGregor (pp. 139, 140); An Improved Oviposition Cage for the Codling Moth, by R. F. Sazama (pp. 140, 141); The Residue Problem and Fluorine Compounds, by S. Marcovitch (pp. 141, 142); The Relative Toxicity of Rotenone and Some Related Compounds as Stomach Insecticides, by H. H. Shepard and F. L. Campbell (pp. 142–144); and The Beech Scale (*Cryptococcus fagi* Bärenspr.), Recently Discovered in New England, by C. W. Collins (pp. 144, 145).

Insects of Indiana for 1930, J. J. Davis (*Ind. Acad. Sci. Proc., 46 (1930), pp. 307–320, figs. 3*).—This is a sixth annual summary of the occurrence of insects in Indiana, presented under the headings of crops, stored products, etc., attacked.

[Report of work in entomology] (*New Mexico Sta. Rpt. 1931, pp. 32–34, 35, 36, 52, 54*).—In the codling moth investigations (E. S. R., 65, p. 244) particular attention was given to attrahent baits (E. S. R., 66, p. 453). The comparative attractiveness of cane and malt sirup baits, a comparison of aromatic chemicals, a comparison of the effectiveness of poison bands, applications of spray, and a parasite survey in which the hymenopterous parasite *Dibrachys boucheanus* Ratz. and a coleopterous predator, *Cymatodera aethiops* Wolcott, both reared from larvae hibernating in bands, are dealt with.

Reporting briefly upon insects affecting field and garden crops, those noted include grasshoppers, of which the principal species involved were the differential grasshopper and the red-legged grasshopper; the squash bug; the false chinch bug; and several species of blister beetles.

[Report of work in entomology] (*Ohio Sta. Bul. 497 (1932), pp. 70–85*).—Following a brief consideration of the occurrence of insect pests during the year (E. S. R., 64, p. 649) and the relation of the drought of the preceding year to their abundance, by J. S. Houser, the report deals with the occurrence of and work with some of the more important pests. These include the oriental fruit moth and its parasites, particularly *Macrocentrus ancylivora* Roh., and control work with insecticides, conducted by R. B. Neiswander and M. A. Vogel. An account of experimental work with the codling moth, by C. R. Cutright, includes studies of its biology, experimental spraying, and banding. Brief notes are given on work by Cutright with the apple maggot, and on the onion maggot, by J. P. Sleesman, which includes seasonal development, variety and date of planting, and insecticides. Work with the onion thrips, by Sleesman, and the gladiolus thrips *Taeniothrips gladioli* Moult. & Steinw., by E. A. Herr, is briefly noted, followed by an account of control work with the potato flea beetle on potatoes, by H. L. Gui, which includes the use of arsenical sprays, arsenical dusts, and pyrethrum sprays. A report of work with the European corn borer, by L. L. Huber, C. R. Neiswander, J. B. Polivka, and E. G. Kelsheimer, is given under the headings of increase in population, 1931; seasonal history, 1931; larval survival; factors important in 1931; larval feeding habits; insecticides, 1931; and varietal experiments.

[Report of work in entomology] (*South Dakota Sta. Rpt. 1931, pp. 24–27*).—Brief notes are reported on the year's work on the plum tree borer,

officially known as the lesser peach borer, the cyrtacanthacrine grasshoppers, and the honeybee and other pollinating agents of sweetclover.

Observations on shade tree insects, E. P. Felt and S. W. Bromley (*Jour. Econ. Ent., 25 (1932), No. 1, pp. 39–46*).—A report of observations made during 1931 in the northeastern United States.

The toxicity of certain plant extracts to goldfish, N. L. Drake and J. R. Spies (*Jour. Econ. Ent., 25 (1932), No. 1, pp. 129–133*).—The toxicity of acetone extracts of certain reputedly poisonous plants for goldfish is said to have been determined. Some of these extracts were found to be more toxic than a control extract made from a Derris root known to contain 1.7 per cent of rotenone.

A bacterial disease of beans transmitted by Heliothrips femoralis Reut., D. Buchanan (*Jour. Econ. Ent., 25 (1932), No. 1, pp. 49–53*).—Controlled experiments conducted in the greenhouse by the Minnesota Experiment Station show that *H. femoralis* may transmit a bacterial disease of beans. Successful transmission was obtained in preliminary investigations by using thrips that had fed on diseased plants for a period as short as 40 minutes. While several virus diseases have been shown to be thus transmitted, this is thought to be the first case in which thrips have been shown experimentally to disseminate a bacterial disease of plants.

Leafhoppers injurious to apple trees, W. J. Schoene (*Virginia Sta. Bul. 283 (1932), pp. 34, figs. 14*).—The occurrence of leafhoppers in abundance in well-sprayed and well-cared-for orchards in some six counties in the apple belt of Virginia extending over a period of 10 or more years led to the field studies from 1927 to 1931 and the life history studies here reported.

It has been found that the leafhopper infestation occurs in the same well-sprayed and well-cared-for orchards year after year, the pest never having been observed in abundance in neglected orchards nor on isolated trees. It is thought that the succulence of the growth of the tree is one of the conditions which influence this infestation. Four species have been found generally abundant. The white apple leafhopper *Typhlocyba pomaria* (McAtee) is the most destructive to bearing orchards, it being generally the most numerous and responsible for the serious foliage injury and specking of the fruit. The other three, the red apple leafhopper *Erythroneura hartii*, the oblique striped leafhopper *E. obliqua*, and the broad striped leafhopper *E. dorsalis*, are closely related forms that are marked with bright red and are found associated with *T. pomaria*. In some seasons one or the other of these three species often outnumbers the white apple leafhopper. These insects contribute to the foliage injury and to the specking of the fruit. They pass the winter as adults in the leaves and rubbish under the apple trees. There is one full brood and a partial second brood, or two full broods each year. The accounts given of the life histories of the four species are accompanied by a graphic presentation of the information by means of charts.

The leafhoppers have been observed to disappear from the foliage during periods of rainy weather, frequent rains apparently being unfavorable to both nymphs and adults. Dry weather appears to be favorable, the adults living longer and a large percentage of the nymphs reaching maturity. During 1930, however, when the drought was very severe, leafhoppers were observed only on trees which were favorably situated with reference to moisture.

In control work it has been found that the regular sprays, consisting of lime-sulfur and Bordeaux, as applied in Virginia orchards do not prevent leafhopper development. Contact insecticides can be effectively employed during the period when the nymphs are present. The first brood of *T. pomaria* can be reduced in numbers by combining nicotine with one of the regular sprays.

The exact time will depend upon the hatching of the leafhopper eggs, which occurs between the petal-fall and three-weeks spray. A special spray can be applied some time in August for the second brood. The nymphs of *E. hartii* can be controlled by adding nicotine to the regular midsummer spray. For a special spray directed only against the nymphs, nicotine sulfate (40 per cent) diluted 1 : 1,200 should be combined with 1 per cent summer oil.

A list is given of 24 references to the literature.

Field studies of the beet leafhopper (Eutettix tenellus Baker), R. W. Haegele (*Idaho Sta. Bul. 182 (1932), pp. 51, figs. 10*).—This report of studies of the beet leafhopper in Idaho commenced in 1925, the details of which are given in 13 tables, takes up the subject under the headings of distribution and abundance of host plants; life history; host plant relationships; migration; field station data; soil analysis; and State survey collection notes, 1925–1929.

Important breeding grounds of this pest were found in southwestern Idaho, they being west and northwest and some distance from the sugar beet-producing districts in Twin Falls, Gooding, Jerome, Cassia, and Minidoka Counties of southern Idaho. Important breeding areas were also found adjacent to these sugar-beet districts. A similarity was found in the environment of the insect throughout southern and southwestern Idaho. The spring host plants studied were tumble mustard (*Norta altissima*) and flixweed or herb sophia (*Sophia parviflora*); the summer hosts were Russian thistle (*Salsola pestifer*), red scale (*Atriplex rosea*), and seep weed (*Bassia hyssopifolia*). The pest was found to winter in the adult stage in the female form only on the waste and uncultivated desert areas. These females oviposit in the spring host plants, on which the first generation develops, completing their growth in May or June. The second generation is completed during July and August, and the third is either partially or wholly completed during the fall.

It is pointed out that beets are not necessary for the completion of the life cycle or seasonal life of the insect because of the nature of the host plant sequence on the desert breeding grounds. The spring host plants were found to be of fundamental importance, since they are the direct source and producers of the vast numbers of beet leafhoppers that migrate into the beet fields every spring and which are responsible for a heavy loss to the sugar-beet industry in southern Idaho. The Russian thistle was found to be the most important summer host plant because of its wide distribution and abundance and because of the great numbers of the insects found to be breeding on it.

It was found that a migration of the new adults from the desert breeding grounds occurs every year at about the time of the completion of the first generation. From this migration there is a dispersal of the insects to the summer host plants in the desert and into the beet fields throughout the irrigated districts lying east and southeast of the desert breeding areas. The western limit of the source of the migration is not known, but it is thought to extend a considerable distance to the northwest of the beet fields of southern Idaho. There is a continuity of breeding grounds in that direction, and the prevailing winds of that section are northwest. The migration occurs a few days earlier in the western than in the eastern part of the area studied.

These insects are found in greatest abundance in environments with a sparse host plant growth. The temperatures are found to be higher in such places. The soil analysis of the host plant areas showed the soluble salts to be highest where *B. hyssopifolia* was common. Such soils were not favorable to the growth of the other host plants. The host plants showed a tendency to mature earlier and were more susceptible to drought on the soils with the lower wilting coefficients. The State survey for the beet leafhopper from 1925 to 1929, in-

clusive, showed no variation from year to year in the distribution of the insect or of its host plants. There is a noticeable variation from year to year in the populations of the insect in different parts of the State.

A preliminary report on the resistance of certain legumes to certain homopterous insects, E. M. Searls (*Jour. Econ. Ent., 25 (1932), No. 1, pp. 46–49*).—Experiments and observations made at the Wisconsin Experiment Station indicate that in that State certain strains of canning peas and alfalfa vary in their resistance to the pea aphid and the potato leafhopper, respectively, in direct proportion to the value of the yellow color of the plant.

The Aphidae of Colorado, Part I, C. P. Gillette and M. A. Palmer (*Ann. Ent. Soc. Amer., 24 (1931), No. 4, pp. 827–934, figs. 100*).—This contribution from the Colorado Experiment Station deals with the aphids infesting both the native and introduced plants occurring in the State, and includes brief notes on food plants and life histories. A key to the families of Aphoidea and keys to the subfamilies of Aphidae, tribes, subtribes, genera, and species are included. Two new varieties, namely, *Cinara apini villosa* and *Myzocallis discolor coloradensis*, are described.

***Insecticidal activity of aliphatic thiocyanates.*—I, Aphis,** D. F. Murphy and C. H. Peet (*Jour. Econ. Ent., 25 (1932), No. 1, pp. 123–129*).—It is pointed out that certain aliphatic thiocyanates have shown high insecticidal value against a variety of insects, the results of extended tests against the bean aphid being here reported.

Efforts toward biological control of the common pink mealybug Trionymus sacchari (Cockerell) of sugar cane on Negros, F. C. Hadden and A. W. Lopez (*Philippine Jour. Sci., 46 (1931), No. 2, pp. 221–223*).—This is a contribution by the Hawaiian Sugar Planters' Experiment Station and the Philippine Sugar Association cooperating in the control of the pink mealybug (*T. sacchari*) of cane, which though not as important in Negros as on Luzon still is of sufficient importance to warrant attempts at more complete control. Two natural enemies from Luzon were liberated in parts of Negros, one a coccinellid of the genus Scymnus (or Pullus), the life history of which is completed in about a month, and the other an encysted parasite of the genus Anagyrus.

San Jose scale returns in Michigan, R. H. Pettit (*Michigan Sta. Quart. Bul., 14 (1932), No. 3, pp. 186, 187, fig. 1*).—In this brief account the fruit growers are urged to examine orchards carefully to determine the presence of the San Jose scale in order that it may be checked before doing serious damage.

***An air-pressure extension brush for applying creosote to gipsy moth* egg clusters,** C. W. Collins and J. V. Schaffner, Jr. (*U. S. Dept. Agr. Circ. 204 (1931), pp. 8, figs. 4*).—A detailed description, specifications, and illustrations are given of an extension brush fed by air pressure that has been devised by the authors. The tests seemed to prove that the use of the new brush, which may be mounted on a long bamboo pole, saves some time, generally saturates the egg clusters more thoroughly, and is cleaner than the old methods. They did not show a saving in the amount of creosote used, but more of the creosote actually was applied to the egg clusters because of the added ease of keeping the brush wet and the elimination of waste due to the creosote dripping from the brush while the pole was being raised.

The control of cherry case bearer (Coleophora pruniella) by dormant and other sprays, R. Hutson (*Jour. Econ. Ent., 25 (1932), No. 1, pp. 118–120*).—It was found at the Michigan Experiment Station that *C. pruniella* is susceptible to control by dormant applications of rather high concentrations of oil emulsions, miscible oils, and tar washes. It was also found that nicotine

and Derrisol combined with lime-sulfur 1 to 40 can be used effectively if properly timed.

Control of cherry case-bearer, R. Hutson (*Michigan Sta. Quart. Bul., 14 (1932), No. 3, pp. 188–190, figs. 2*).—Essentially noted above.

The grape-berry moth in 1932, R. H. Pettit (*Michigan Sta. Quart. Bul., 14 (1932), No. 3, pp. 167–170, figs. 3*).—A brief practical account is given of the most destructive insect depredator of grapes in Michigan and means for its control.

Corn earworm, Heliothis obsoleta, as a greenhouse pest, E. I. McDaniel (*Michigan Sta. Quart. Bul., 14 (1932), No. 3, pp. 183–186, figs. 3*).—This gives a brief practical account of the corn ear worm, which appeared in greenhouses in late August and early September, 1931, in practically all parts of Michigan and caused unusual losses of ornamental plants, and means for its control.

Efficiency of bait traps for the oriental fruit moth as indicated by the release and capture of marked adults, W. P. Yetter, jr., and L. F. Steiner (*Jour. Econ. Ent., 25 (1932), No. 1, pp. 106–116*).—Extensive liberations of marked oriental fruit moths within and at varying distances from large baited areas at Vincennes, Ind., and at Cornelia, Ga., proved that owing to adult migration the benefits derived from the use of baits were spread over much more than the immediate area baited. At Vincennes flights of from 2,000 to 6,500 ft. over baited territory occurred following 12 of the 18 releases made there. At Cornelia flights of more than a mile from unbaited to baited peach orchards were recorded. Twenty-six per cent of 53 moths released in an unbaited orchard one-third mile from the center of a 37-acre trapped block were captured in the latter area. Of releases made within baited orchards recoveries ranging from 16 to 85 per cent were made. Little oviposition occurs within 48 hours after adult emergence. Flights of as much as two-fifths mile from unbaited into baited territory occurred within this time. At Cornelia released moths recovered within 2 days contained an average of 141 eggs, while those recovered between 2 and 5 days after release averaged 126 eggs. Most recoveries were made within 5 days, some, however, as late as the fourteenth day.

A mixture of baits in an area appeared more efficient than a single bait. All efforts at artificial control of the oriental fruit moth not conducted on a large scale or in isolated orchards will tend to be nullified following emergence of each brood if migration occurs as readily in unbaited as in baited orchards.

Small plots in codling moth field experiments, C. R. Cutright (*Jour. Econ. Ent., 25 (1932), No. 1, pp. 74–77*).—A discussion of a plan thought worthy of trial.

Notes on the control of the codling moth, S. W. Frost (*Jour. Econ. Ent., 25 (1932), No. 1, pp. 77–83*).—Experimental control work with the codling moth at the Pennsylvania Experiment Station extending over a period of eight years is reported upon. It is concluded that the fourth or petal-fall application is not as effective as the following spray. Notes on the effectiveness of poisons other than arsenate of lead are included.

A laboratory-field method for the study of the efficiency of codling moth sprays, F. H. Lathrop and R. F. Sazama (*Jour. Econ. Ent., 25 (1932), No. 1, pp. 83–98, pl. 1, figs. 2*).—A report upon a method that has been devised for the study of the larvicidal efficiency of codling moth sprays by a combination of laboratory and field technic.

On the length of the adult life in the webbing clothes moth, Tineola bisselliella Hum., G. H. Griswold (*Ann. Ent. Soc. Amer., 24 (1931), No. 4, pp. 761–764, fig. 1*).—A report upon observations of 143 males and 171 females of the webbing clothes moth which emerged in individual vials. The minimum

length of adult life of the males was 13 days, the maximum 79 days, and the average 41.755 days. The minimum length of adult life of the females was 10 days, the maximum 48 days, and the average 21.818 days.

Some observations on the seasonal history of the European corn borer, Pyrausta nubilalis Hbn., in Indiana, G. A. FICHT (*Ind. Acad. Sci. Proc., 46 (1930), pp. 335–338, fig. 1*).—In observations by the Indiana Experiment Station the average dates of the occurrence of maximum pupation, moth emergence, and egg deposition of the European corn borer for the two years 1929 and 1930 were June 17, July 5, and July 7, respectively. The mean date of the first appearance of infested plants was June 28, and the first full-grown larvae appeared on July 27 and all larvae were in the final instar and full fed on August 27. The extreme heat and drought of 1930 were responsible for the retarded spread of the borer into new territory, a smaller increase in the intensity of the infestation, and a lessened accumulation of borers in the old infested area of the State than would have occurred during a normal season.

The effects of certain poisons upon mosquito larvae, M. FROBISHER, JR., and R. C. SHANNON (*Amer. Jour. Hyg., 18 (1931), No. 2, pp. 614–622*).—The authors have found iodine to be fatal for full-grown larvae of the yellow-fever mosquito, *Aedes taeniorhynchus*, and *Culex quinquefasciatus* in concentrations of about 0.0001 per cent or 1 part per million. Newly hatched larvae were much more susceptible than the full-grown larvae. Pupae were much more resistant to iodine than were any larvae. Bromine was found to be almost as poisonous for the larvae as iodine. Potassium cyanide was found to be relatively inert as compared with the iodine. It is pointed out that iodine may be applied to drinking water in concentrations sufficient to kill larvae yet insufficient to give a perceptible taste.

The winter breeding and activity of culicine mosquitoes at New Orleans (30° N. Lat.), E. H. HINMAN (*Amer. Jour. Trop. Med., 11 (1931), No. 6, pp. 459–467, pl. 1*).—A correction made of data obtained in a periodic survey of breeding conditions of the culicine mosquitoes in New Orleans from September 25, 1930, to June 15, 1931, with meteorological statistics seems to indicate that "after a monthly mean temperature of 52.5° F. has been reached little outdoor breeding of *Aedes aegypti* is encountered. Indoor breeding of this species continues during even the coldest months and is of considerable significance in the overwintering of the species. *Culex quinquefasciatus* and *C. salinarius* are apparently hardier species and continue development out-of-doors through the entire year, although oviposition may be suspended during part of January and February. Owing to the rather abnormal weather conditions during the period under investigation, it is felt that the season of extensive breeding was curtailed earlier in the winter and its resumption prevented in the spring, thereby making it shorter than might be expected in a normal year."

Method to reduce losses caused by ox bot, R. H. PETTIT (*Michigan Sta. Quart. Bul., 14 (1932), No. 3, pp. 190, 191*).—It is pointed out that a Derris compound on the market known as Gusanol, when applied in very small amounts over the opening of the skin above the bodies of the grubs, will kill them without injury to the animal.

The biology and control of the blueberry maggot in Washington County, Me., F. H. LATHROP and C. B. NICKELS (*U. S. Dept. Agr., Tech. Bul. 275 (1932), pp. 77, pls. 14, figs. 30*).—A detailed account is given of investigations conducted in Washington County, Me., from the summer of 1925 until the close of the season in 1929. The data, the details of which are given mainly in tabular and chart form, relate to the blueberry industry and lands, history of blueberry maggot, injury, economic importance of the blueberry maggot infesta-

tion, fruits infested, species involved, summary of life history studies, difficulties encountered in studies of life cycles, emergence of adults, habits of the adults, longevity and occurrence of flies in the field, oviposition, studies of maggot populations and the incubation period, pupation, natural enemies, control, and recommendations for the control of the blueberry maggot in eastern Maine. Progress reports of the authors' studies have been noted (E. S. R., 66, pp. 455, 557), as have studies of this pest by the Maine Experiment Station (E. S. R., 49, p. 657; 65, p. 756).

Hot water as an insecticide for the Japanese beetle in soil and its effect on the roots of nursery plants, W. E. Fleming and F. E. Baker (*U. S. Dept. Agr., Tech. Bul. 274 (1932), pp. 42, figs. 13*).—This is a report of work conducted during the years 1920, 1926, 1927, 1928, and 1929 at Moorestown, N. J.

It was found that all stages of the Japanese beetle could be killed by immersion in water at temperatures ranging from 110 to 130° F. "In general, the necessary period of treatment varied inversely with the degree of temperature, but some stages were slightly more resistant than others. Treatment with hot water at 112° for 70 minutes was found to be practically exterminative of all stages of the beetle. A tank was developed in which water in circulation could be maintained at a constant temperature. Tests were made to determine the time required to cause masses of soil of different sizes and types to become heated throughout to a given temperature. Laboratory tests indicated that the hot water treatment was fatal to Azalea, Rhododendron, Picea, Berberis, and Hydrangea, but could be used successfully on Dahlia, Iris, Paeonia, Phlox, Forsythia, Spiraea, Syringa, and Weigela (Diervilla)."

The results obtained in the hot water treatment of a large number of plants are reported in tabular form, and recommendations based on the experimental work are included.

A reply to Burrell and Parris on the use of calcium cyanide raw linseed oil mixture for the control of the round headed apple tree borer, C. E. Petch (*Jour. Econ. Ent., 25 (1932), No. 1, pp. 121, 122*).—In this defense of the calcium cyanide-raw linseed oil mixture for use against the round-headed apple tree borer, the value of which was questioned by Burrell and Parris (E. S. R., 65, p. 854), its safeness when used according to directions is pointed out. It is said that the mixture has been used successfully for several years in Canada and is still being recommended.

The migratory habit of the spotted cucumber beetle, C. E. Smith and N. Allen (*Jour. Econ. Ent., 25 (1932), No. 1, pp. 53–57*).—In observations made by the Louisiana Experiment Stations and the U. S. D. A. Bureau of Entomology cooperating, which have extended from Louisiana northward through the Mississippi Valley, the spotted cucumber beetle was found to migrate northward regularly during the spring and early summer and the offspring to migrate back to the south during the fall, with none surviving the winter north of central Missouri and no true hibernation occurring in the south. The number of generations matured during the annual advance and retreat remains to be determined.

Notes on the life history of the striped blister beetle in southern Louisiana, J. W. Ingram and W. A. Douglas (*Jour. Econ. Ent., 25 (1932), No. 1, pp. 71–74*).—An account is given of the life history of *Epicauta lemniscata* Fab. in southern Louisiana.

A seven year survey of the plum curculio in southern Illinois, S. C. Chandler (*Jour. Econ. Ent., 25 (1932), No. 1, pp. 101–106, figs. 2*).—In the author's study in southern Illinois jarrings demonstrated the occurrence of the plum curculio on peach throughout each season. Petal-fall and post-season

sprays were found to be necessary. Important periods for spraying are indicated, and the number of broods and the effect of weather conditions on abundance are discussed.

An illustrated synopsis of the principal larval forms of the order Coleoptera, A. G. Böving and F. C. Craighead (*Ent. Amer., n. ser., 11 (1930), Nos. 1, pp. 80; 2, pp. 81–160, pls. 36; 3, pp. 161–256, pls. 48; 4, pp. 257–351, pls. 41*).—This contribution, which is based upon a study projected about 1915, includes a key to the superfamilies and keys to the families, subfamilies, and occasionally tribes of Coleoptera based upon larval characters, presented in connection with 125 plates.

[Report of work in apiculture] (*Wyoming Sta. Rpt. 1931, pp. 25–28, 29, 30*).—The work in apiculture by C. L. Corkins referred to includes wintering (E. S. R., 64, p. 550), breeding, American foulbrood, and flight range.

An important new encyrtid parasite of the mealybug, Pseudococcus virgatus (Ckll.), H. L. Dozier (*Ent. Soc. Wash. Proc., 34 (1932), No. 1, pp. 7–9, fig. 1*).—Under the name *Anagyrus coccidivorus* the author describes a new parasite which is of decided economic value, being probably the greatest single factor in checking this mealybug enemy of papaya fruit in Haiti. The pest is widely distributed throughout the West Indies and the southern United States and recorded from a varied list of host plants.

Laelius anthrenivorus Trani, an interesting bethylid parasite of Anthrenus verbasci L. in France, A. M. Vance and H. L. Parker (*Ent. Soc. Wash. Proc., 34 (1932), No. 1, pp. 1–7, fig. 1*).—This is said to be the first record of *L. anthrenivorus* in France and the only noted instance of its occurrence anywhere as a parasite of the varied carpet beetle. It is ectoparasitic in the larval stage on certain of the Dermestidae which infest museum collections.

Collecting parasites of the sugarcane borer in South America, H. A. Jaynes (*Jour. Econ. Ent., 25 (1932), No. 1, pp. 64–68*).—In collecting and rearing parasites of the sugarcane borer in Argentina and Peru several species were found, but large shipments were made of only two, over 637,000 puparia of the dexiid fly *Paratheresia claripalpis* V. d. Wp. and 63,000 females of the wasp *Ipobracon rimac* Wolcott being shipped during three seasons.

Receiving parasites of the sugarcane borer in Louisiana, T. E. Holloway, W. E. Haley, and E. K. Bynum (*Jour. Econ. Ent., 25 (1932), No. 1, pp. 68–71*).—The shipping and insectary methods used in handling parasites received from South America, as mentioned above, are described.

Results of Trichogramma colonization on sugarcane borer damage in Louisiana in 1931, W. E. Hinds and B. A. Osterberger (*Jour. Econ. Ent., 25 (1932), No. 1, pp. 57–64*).—A brief review is given of work with *T. minutum* Riley at the Louisiana Experiment Stations in 1931, as measured by three indices, including the destruction of borer eggs by parasitism, the moth population developed in the fields during the season—excluding the hibernating generation—and the percentage of cane joints showing one or more borer burrows per joint as the cane is cut at harvest time. It is held that these indices all point conclusively to a reduction of from 30 to 50 per cent of the potential and prospective borer damage as a result of the colonization of from 5,000 to 6,000 parasites per acre at a favorable time.

Tests show way to control raspberry mites, R. Hutson (*Michigan Sta. Quart. Bul., 14 (1932), No. 3, pp. 191–193*).—It is pointed out that mites, particularly *Tetranychus bimaculatus*, *Paratetranychus ilicis*, and the new species *T. mcdanieli*, which for many years have caused losses to raspberry growers in southwestern Michigan, can be controlled by the application at 1 per cent strength of summer oils alone or in combination with Bordeaux mixture.

Nicotine and Penetrol, Derrisol and soap, and glue have also been applied with success. On the bases of cost, ease of application, compatibility, and tolerance of the plant, the summer oils, Volck and Verdol, used at 1 per cent strength, seemed, as a result of the tests conducted, to be the most satisfactory killing agents for controlling the spinning mites infesting raspberries.

ANIMAL PRODUCTION

Breeds of live stock in America, H. W. Vaughan (*Columbus, Ohio: R. G. Adams Co., 1931, pp. 780, figs. 426*).—In this treatise the author gives something of the origin, history, and desirable characters of the various breeds of livestock in this country.

[Feeding and nutrition experiments with livestock at the Ohio Station] (*Ohio Sta. Bul. 497 (1932), pp. 121, 122, 125–138, 143, 144, 172–174, figs. 5*).—This report includes results of tests with beef cattle, sheep, swine, and poultry.

The cattle studies include a determination of the value of first-year sweetclover hay for fattening steers, by P. Gerlaugh and H. W. Rogers; the value of Palmo Midds and of molasses for fattening calves, by Gerlaugh; and the relative efficiency and profitableness of various grades of feeder steers, by Gerlaugh and C. W. Gay.

Under sheep studies are reported a determination of the sheep-carrying capacity of second-year sweetclover and molasses for fattening lambs, by D. S. Bell; and the value of timothy hay for wintering ewes, by Bell, L. E. Thatcher, and C. H. Hunt.

Hog work was designed to determine methods of handling hogs to prevent shrinkage during shipping, dressed yields of barrows and sows, the value of kelp for pigs, autoclaving cottonseed meal for pigs, and effect of fish meals on quality of pork, by W. L. Robison; the effect of fluorine on growth and bone development in swine, by R. M. Bethke, O. H. Kick, and B. H. Edgington, susceptibility of animals to gossypol poisoning, by Hunt and W. Wilder; and hogging down wheat, by Robison and P. A. Jones.

The poultry tests included studies on the effect of keeping birds in cages, by D. C. Kennard; oats for layers and methods of feeding whole grain and using all-night lights for layers, by Kennard and V. D. Chamberlin; nutritional leg paralysis of chicks and nutritional factors affecting hatchability of eggs, by Bethke, P. R. Record, and Kennard; comparative value of different fish meals for chicks, by Bethke and Record; iodine content of eggs, by Bethke, O. H. M. Wilder, and Record; and hens v. pullets for egg production, by Kennard and H. S. Elliott.

[Animal production studies at the Ohio county experiment farms] (*[Ohio Sta., Co. Expt. Farms Rpts.] 1930, Clermont Co. Farm, p. 4; Madison Co. Farm, pp. 1–4; Washington Co. Farm, pp. 3, 4*).—The studies reported include data on all-night light for layers; the value of corn in silage v. shelled corn for steers, trinity mixture v. other protein supplements for hogs, and wheat and other small grains for hogs; and a successful method for raising Easter lambs.

[Feeding tests with livestock] (*South Dakota Sta. Rpt. 1931, pp. 15, 16, 18*).—The swine studies for which results are reported in this publication include feeding soybeans with corn to avoid soft pork, worming pigs with oil of chenopodium, vitamin D potency of milk, comparison of corn, wheat, and barley for fattening summer pigs, and a comparison of corn, barley, and spelts for fattening fall pigs. Other work reported includes a comparison of flax straw and alfalfa hay for feeding cattle and a comparison of the metabolism of several calcareous materials by laying hens.

[Animal husbandry studies in Wyoming] (*Wyoming Sta. Rpt. 1931, pp. 15, 16, 20, 21, 44, 45, 46, 47, 51, 53*).—These studies include results as to gains in weight and wool production for crossbred lambs from a flock of ewes sired by Rambouillet, Southdown, Corriedale, Hampshire, and Lincoln rams; gains in weight for 5 lots of ewe lambs wintered at Eden on various grains and forages (E. S. R., 65, p. 161), 7 lots of lambs at Torrington, and 10 lots of lambs at Worland; continuing previous work (E. S. R., 65, p. 166), comparisons by S. S. Wheeler of rye and barley with corn for hogs, and at the Gillette Substation of various home-grown grains for hogs; feeding tests at the Lyman Substation (E. S. R., 65, p. 169) comparing barley and corn for laying hens; and tests of the use of lights and of modifications of the standard New Jersey ration at the Torrington Substation.

The effect of artificial drying upon the vitamin A content of alfalfa, S. M. Hauge and W. Aitkenhead (*Jour. Biol. Chem., 93 (1931), No. 2, pp. 657–665, figs. 3*).—The Indiana Experiment Station studied the effect of two processes of artificial drying of alfalfa and the field curing method upon the vitamin A content of the hay. Young rats were fed vitamin A deficient rations until the storage of vitamin A in the animal was exhausted. Either second or third cutting alfalfa ad libitum was then added to the ration. The animals were fed in individual cages of a type which prevented access to excreta.

Artificial drying tended to preserve the vitamin A content of the alfalfa, while field curing was rather destructive to vitamin A. The use of heated air or hot flue gas in mechanical drying was equally effective in preserving vitamin A. Neither the high temperature used in artificial drying nor the ultra-violet rays of the sun were destructive to the vitamin A content of the alfalfa. The evidence indicated that enzymes are the important factor in vitamin A destruction during field curing. It was concluded that conditions which either favor or are adverse to enzyme activity tend to lower or preserve, respectively, the vitamin A content of alfalfa.

Edible fish-meal, edited by R. DeLisle (*Victoria: Brit. Columbia Fisheries Dept., 1930, pp. 80, pls. 3*).—This pamphlet, published by the provincial fisheries department of British Columbia, contains information as to the composition of edible fish meal, its feeding value for cattle, sheep, swine, and poultry, and instructions for its use. The results of researches and experiments in many countries in the feeding of fish meal to livestock are reviewed.

Rice and its by-products for feeding livestock, E. W. Sheets and A. T. Semple (*U. S. Dept. Agr., Misc. Pub. 132 (1931), pp. 9, figs. 3*).—A practical publication giving information concerning the production of rice and its by-products, the composition and feeding value of these feeds for the various classes of livestock, methods of feeding, and suggested rations containing rice or rice by-products.

Feedlot fattening rations for cattle, G. E. Morton and H. B. Osland (*Colorado Sta. Press Bul. 77 (1931), pp. 7*).—Continuing this study (E. S. R., 64, p. 551), six lots of 10 calves each, averaging 415.3 lbs. per head, were fed for 194 days on a basal ration of ground barley, cottonseed cake, alfalfa hay, mineral mixture, and salt. In addition lot 1 received cull potatoes and wet beet pulp; lot 2, wet beet pulp; lot 3, cull potatoes; lot 4, potato and corn silage fodder; and lot 5, corn silage. The average daily gains in the respective lots based on market weights were 2.1, 2.1, 2, 1.9, 1.8, and 1.9 lbs. per head.

The ration fed in lot 6 produced good gains at a reasonable cost, but the ground barley when fed as the sole grain concentrate had a tendency to cause bloating. The ration fed in lot 2 proved to be the most efficient and the cheapest used in this test. Corn silage ranked next to wet beet pulp as a

bulky carbonaceous feed. The potato-corn fodder silage, a mixture by weight of 18 per cent dry corn fodder and 82 per cent cull potatoes, proved to be palatable and was a good roughage for calves. Cull potatoes were satisfactory as a supplement to a limited amount of pulp.

Rations for fattening beef calves, I, II, G. A. BRANAMAN (*Michigan Sta. Quart. Bul., 14 (1932), No. 3, pp. 152–158*).—The studies are continuations of work previously noted (E. S. R., 64, p. 367).

I. *The farm grains—corn, barley, and oats compared.*—In this phase of the study three lots of 9, 10, and 10 head of calves, respectively, averaging 367.6 lbs. per head, were fed for 106 days on a basal ration of linseed meal, corn silage, and alfalfa hay. In addition the respective lots received ground barley, shelled corn, and ground oats. The average daily gains were 2.3, 2.2, and 2.2 lbs. per head in the respective lots. The calves in lot 1 had a slight advantage over the other lots in cost of feed per 100 lbs. of gain, while the pigs in lot 2 salvaged sufficient grain to make the cost of gain even with lot 3. Lot 1 calves were valued slightly higher at the end of the test than the other lots, with lot 3 having a slight advantage over lot 2. The cost of grinding barley and oats changed their relationship to corn by making barley equal to corn and oats somewhat less valuable.

II. *A study of winter rations for calves to be marketed the following September.*—The feeding periods in this study were of 126, 70, and 97 days' duration, respectively. Lot 3 of part 1 was fed as above during the first two periods and was changed from oats to shelled corn and full-fed during the remaining period. Lot 4 was given a full feed of silage and alfalfa hay and enough corn to keep them gaining slightly during the first period, after which the corn was increased and linseed meal added to make a full feed for the other two periods. Lot 5 had a full feed of hay and a half feed of silage during the first period and then had corn, linseed meal, and silage added to make a full-fed ration. The average daily gains in the respective lots for the 293 days were 2.0, 1.8, and 1.7 lbs. per head. Lot 3 consumed about 50 per cent more total grain but much less hay than either of the other lots and somewhat less silage than lot 4. The latter lot ate more silage and less hay than lot 5. Feed costs were lowest in lot 4 and about equal in the other lots. Lot 3 had the highest market valuation and lot 5 the lowest, but the total cost per calf was lowest in lot 4 and highest in lot 5.

Market classes and grades of yearling beef, W. C. DAVIS (*U. S. Dept. Agr. Circ. 208 (1932), pp. 27, pls. 15*).—This is a classification for the market grades and classes of yearling beef. The distinguishing features of yearling and mature beef and of steer and heifer beef are described. The standard classes, definition of grade factors, range of quality within a grade, the grades, wholesale cuts, and the grades of these cuts for yearling beef are discussed. In addition grading meat in general and cloth-dressed carcasses are given some attention.

The Blackhead Persian, a primitively-coated fat-rumped sheep, J. E. DUERDEN and E. BOYD (*Union So. Africa Dept. Agr. Bul. 82 (1930), pp. 46, figs. [27]*).—In this bulletin the authors describe the history and introduction of the Blackhead Persian sheep into South Africa, the general characteristics of the breed, the rump and tail structure, and the nature of the coat of the adult and the lamb.

Production of sows and development of suckling pigs [trans. title], N. E. OLOFSSON and S. LARSSON (*Meddel. Centralanst. Försöksv. Jordbruksområdet [Sweden], No. 371 (1930), pp. 45, figs. 5; Eng. abs., pp. 35–37*).—This investigation was undertaken at Svalöv, Sweden, to determine the milk production of

sows and the rate of development of suckling pigs. In all 200 litters of Large White pigs were included for periods of from 6 to 8 weeks.

It was found that during lactation sows consumed an average per day of 5.7 kg of skim milk, from 4.5 to 5.5 kg of concentrates, and 3 kg of carrots. However, the animals lost an average of 14.4 kg per head during the suckling period. The average daily milk yield from the second to the eighth week was 4.7 kg, and the maximum yield occurred within the first 10 days after farrowing. The colostrum of sows contained 15.8 per cent of protein and 2.73 per cent of fat, while in the normal milk these constituents were 5.75 and 6.42 per cent, respectively.

The pigs averaged 1.27 kg at birth and 13.1 kg at 8 weeks of age. Pigs from small litters were heavier at birth and gained more rapidly during the first few weeks than pigs from larger litters, but after 5 weeks the difference in gain was insignificant. The daily gain in weight increased up to a weight of 90 kg, except during the fourth and fifth weeks, and pigs reached the 90-kg weight in 182 days.

Death losses among pigs were heaviest during the first week and in 50 per cent of the cases in the first few days. The death rate was higher in large litters than in small ones. The average weight of stillborn pigs was the same as that of pigs that died in the first week. This study showed little advantage for dams to increase the size of litters to more than 13 pigs without a simultaneous increase in milk yield of sow, number of sound teats, and birth weight of pigs.

Pigs began to eat additional food at from 3 to 4 weeks of age, but at 8 weeks the sow was still supplying 40 per cent of the total nutritive requirements of the litter. Under favorable conditions pigs in the suckling period reached an average of about 2.4 food units per kilogram of live weight gain.

The relative nutritive efficiency of certain calcium compounds with growing swine, E. B. Fraser (*Sci. Agr., 12 (1931), No. 2, pp. 57–80*).—A feeding experiment was conducted at the Iowa Experiment Station to determine the value of different calcium compounds in the production and economy of gains of pigs. Pigs were divided into 7 lots of 5 head each and were fed the same basal ration for 120 days. In addition the respective lots received the following mineral supplements: Salt; limestone; limestone and calcium sulfate (bone derived); calcium sulfate; sodium sulfate (bone derived); sodium sulfate and calcium sulfate; and bone meal.

The average daily gains in the respective lots were 1, 1.1, 1.4, 1.2, 1.4, 1.3, and 1.3 lbs. per head. With the exception of lot 5 the feed requirements per 100 lbs. of gain in all lots fell within a range of 11 points, while lot 5 had a much higher requirement than the other lots. All the calcium compounds fed appeared to promote good growth, and the calcium sulfate was equivalent to ground limestone as a source of calcium for growing pigs. The combination of ground limestone and calcium sulfate produced larger and more economical gains than when either compound was fed alone. Special bone meal proved to be an excellent supplement for swine, and because of its phosphorus content had some advantages that nonphosphate carriers did not possess.

The effect of ingested cottonseed oil on the composition of body fat, N. R. Ellis, C. S. Rothwell, and W. O. Pool (*Jour. Biol. Chem., 92 (1931), No. 2, pp. 385–398*).—Continuing this work (E. S. R., 65, p. 556) by the U. S. D. A. Bureau of Animal Industry, a test was conducted with pigs in which cottonseed oil was fed at 4, 8, and 12 per cent levels. Two basal rations were used, one of which, containing less than 1 per cent of naturally contained fat, was made up of hominy, tankage, alfalfa meal, and mineral mixture, while the

other with about 4 per cent of naturally contained fat was composed of ground yellow corn, tankage, and mineral mixture. These rations were fed to 7 lots of 3 pigs each and 1 lot of 4 pigs for approximately 100 days with a check lot on each of the basal rations.

The hardest carcasses on slaughtering were secured when 4 per cent of cottonseed oil was fed, the higher quantities causing increasing softness. Analyses of the lard made from the hogs showed a marked increase in the linoleic and stearic acids at the expense of oleic and palmitic acids. The maximum content of total saturated acids occurred when 4 per cent of oil was fed, but the maximum stearic acid content increased steadily up to the 12 per cent level. These results indicated that cottonseed oil contained one or more isomeric forms of oleic or possibly linoleic acid which were readily converted into stearic acid in the body fat.

Feeding cottonseed oil to rats produced a more pronounced softening of body fat than was obtained in hogs. Analyses indicated that changes in fat composition occurred in rats as in hogs following the ingestion of cottonseed oil.

Horsebreeding yesterday and to-day, A. S. CAMPBELL (*London: H. F. & G. Witherby, 1931, pp. 208, pls. 7*).—The author of this treatise presents his observations and experiences relating to the breeding of hunters and Thoroughbred horses.

[Feeding and nutrition studies with poultry] (*New Mexico Sta. Rpt. 1931, pp. 73–75*).—This report contains progress notes on range requirements and substitutes for range for laying hens and the nutritive value of cottonseed meal and alfalfa leaf meal for growing chicks.

The optimum protein content of rations for growing chicks, R. W. SWIFT, A. BLACK, L. VORIS, and E. M. FUNK (*Poultry Sci., 10 (1931), No. 6, pp. 288–298, figs. 2*).—In this study at the Pennsylvania Experiment Station, 5 lots of 25 White Leghorn chicks each were fed for four 28-day periods on rations differing as to protein content. The results were measured by gains in live weight and by chemical analysis of the ration and of the resulting excreta. The protein content was varied by changing the proportion of protein concentrates in the ration with a range of variation from 12.06 to 24.83 per cent.

The digestibility of proteins was not influenced significantly by the level of protein intake. In each of the 4 periods, the lot receiving from 14.74 to 15.31 per cent of protein made the most efficient use of this nutrient, but the level was too low for the most efficient use of the ration as a whole. For the successive periods the lots which made the greatest gains in live weight received rations containing 22.9, 21.21, 17.31, and 14.74 per cent of protein. During the same periods the lots which made the most efficient use of their feeds received 24.83, 21.21, 17.31, and 14.74 per cent of protein. The lot which made the greatest gains in live weight during the entire test received a ration varying in its protein content from 20.29 to 21.9 per cent.

The fate of the antirachitic factor in the chicken.—I, The antirachitic factor balance in the growing chick, D. KLEIN and W. C. RUSSELL (*Jour. Biol. Chem., 93 (1931), No. 2, pp. 693–704, fig. 1*).—The New Jersey Experiment Stations undertook to determine how much of the antirachitic factor from irradiated ergosterol and cod-liver oil was stored in the body of the chick and how much was eliminated in the droppings. White Leghorn chicks were divided into two lots of four each and were put on test 48 hours after hatching. Both lots received the same basal ration, but lot 1 was fed 1 cc of corn oil solution containing 75 rat units of irradiated ergosterol to each 100 g of feed, while lot 2 received 1 cc of cod-liver oil or 23 rat units for each 100 g of feed for 27 days. At the end of the feeding work the chicks were killed and

the carcasses assayed, and in addition 55 unfed chicks were killed 48 hours after hatching and the carcasses treated in the same manner.

Traces of the antirachitic factor were found in the unsaponified residues from the bodies of unfed newly hatched chicks amounting to about 1 rat unit per chick. No traces of the antirachitic factor were found in two 4-weeks-old chicks fed irradiated ergosterol, and none in one chick fed cod-liver oil. Of the total amount of antirachitic factor fed as irradiated ergosterol for 4 weeks, 26.5 per cent of the rat units consumed were recovered in the droppings. When cod-liver oil was used as the source of the antirachitic factor, 43.1 per cent was recovered. There was no evidence to indicate what happened to the remainder of the rat units. Qualitative tests indicated that there was only a slight destruction of the antirachitic factor due to the process of collection and concentration.

The calcium-phosphorus ratio of the tibiae of growing chicks, A. D. Holmes, M. G. Pigott, and P. A. Campbell (*Jour. Biol. Chem., 92 (1931), No. 2, pp. 187–198, figs. 3*).—In this study 29 pens of 40 Rhode Island Red chicks each were grown in commercial battery brooders from hatching to 9 weeks of age on all-mash rations varying in protein, mineral, and vitamin content. At 3, 6, and 9 weeks of age 5 representative chicks from each pen were killed, and the left tibiae were dried, measured, weighed, ashed, and analyzed for calcium and phosphorus. The calcium-phosphorus ratio was compared with the ash content of the ration, the calcium-phosphorus ratio of the ration, the rate of growth of the chick, and the ash content of the tibiae.

There was no correlation between the calcium-phosphorus ratio of the tibiae of 9-weeks-old chicks with the percentage of ash in the ration, with the calcium-phosphorus ratio of the ration, with the body weight of the chick, or with the ash present in the tibiae. These results indicate that calcium and phosphorus are deposited in the bones in a fairly constant ratio regardless of the completeness or incompleteness of bone development.

Free range rearing of pullets, L. M. Black (*New Jersey Stas. Hints to Poultrymen, 20 (1932), No. 6, pp. 4, fig. 1*).—The free range method of rearing pullets, together with the amount of land required for this practice, crops for ranges, care of the range during the season, and other precautions that must be observed are discussed.

Effect of composition of air on the growth and mortality of the chick embryo, A. I. Romanoff (*Jour. Morph. and Physiol., 50 (1930), No. 2, pp. 517–525, figs. 3*).—A study at the New York Cornell Experiment Station showed that the composition of the air in the incubator exerted a marked influence on the growth and mortality of the chick embryo. When a moderate amount of carbon dioxide (0.4 per cent) was present, the growth of the embryo during the first few days was stimulated. When 1 per cent of carbon dioxide was present it caused slow growth, the formation of abnormalities, and early death. A temporary exposure to 10 per cent of carbon dioxide and 18.8 per cent of oxygen brought about a reduction in the size of the embryo without apparent deformities or increase in mortality. The maximum amounts of carbon dioxide and oxygen possible for the growth of the embryo were about 22 and 16.3 per cent, respectively.

The surface area of Single Comb White Leghorn chickens, H. H. Mitchell (*Jour. Nutrition, 2 (1930), No. 5, pp. 443–449*).—The Illinois Experiment Station found that the surface area of Single Comb White Leghorn chickens of both sexes could be predicted by the equation $S=8.19\,W^{[illegible]}$, in which S is the surface area in square centimeters and W the body weight in grams.

Judging poultry, H. M. LAMON and J. W. KINGHORNE (*Washington, D. C.: Authors, 1931, rev., pp. [2]+113, figs. 20*).—This work was designed to amplify the descriptions of the American Standard of Perfection (E. S. R., 64, p. 169) and to guide and assist the student of poultry judging.

Suggestions for prospective poultry farmers, C. S. PLATT (*New Jersey Stas. Hints to Poultrymen, 20 (1932), No. 4, pp. 4, fig. 1*).—The author makes suggestions as to the capital required, location and size of farm, construction of buildings, kind of stock to buy, and methods of becoming established in the industry that should be helpful to a beginner in the poultry business.

Make survey of costs of raising pullets, K. T. WRIGHT (*Michigan Sta. Quart. Bul., 14 (1932), No. 3, pp. 125–130, fig. 1*).—In cooperation with 37 farmers, records were kept of the cost of the chicks, the amount and value of feed fed to them, the time spent in caring for the chicks, and of all other items of expense and income obtained from chicks before they were 24 weeks old.

The average cost of raising pullets to 24 weeks of age in 1931 was 69 cts., with a range of from 37 cts. for the 10 low farms to $1.09 for the 10 high farms. Each farmer started with an average of 638 chicks, and the mortality was 11.3 per cent at 12 weeks and 15.7 per cent at 24 weeks. The average cost of each chick at 12 weeks was 35.2 cts. Broilers usually sold at about 13 weeks of age, averaging 2.2 lbs. per head for an average of 20 cts. per pound. The farms raised an average of 38 pullets out of every 100 chicks to 24 weeks of age, at which time pullets of the light breeds averaged 3.4 lbs. and those of the heavy breeds 4.4 lbs. per head.

Of the total cost at 24 weeks, feed made up 42.2 per cent, cost of chicks 22.2, labor 16.3, equipment and brooder-house charges 7, and other costs 12.3 per cent. The average feed consumption was 5.1 lbs. of mash and scratch per pound of poultry produced.

Michigan contest has successful year: Records of ninth contest prove high producing hens can make profit even when egg prices are low, E. S. WEISNER (*Michigan Sta. Quart. Bul., 14 (1932), No. 3, pp. 123–125*).—Data from this State egg-laying contest are briefly discussed.

Feeding different amounts of protein to growing turkeys, J. M. MOORE (*Michigan Sta. Quart. Bul., 14 (1932), No. 3, pp. 148–152*).—Rations containing 20.7, 25.1, 17, and 28.1 per cent of protein were fed to four lots of turkeys, and comparisons were made of the growth of the birds at 22 weeks of age. The ration fed in lot 3 did not produce the gains in weight nor the quality of meat that the other rations did. There was little difference in the other lots in weight at 22 weeks of age, but the birds in lot 4 made the best gain on the least amount of feed. The study also showed that turkeys of the Bronze breed should weigh at least 10 lbs. per head when killed in order that the carcasses show a satisfactory finish.

Rations for rabbits compared in tests, R. A. CONOLLY and C. G. CARD (*Michigan Sta. Quart. Bul., 14 (1932), No. 3, pp. 146–148*).—In this study of rations for rabbits it was found that substituting ground oats for ground oatmeal reduced the cost of the ration 17 cts. per hundredweight. While ground oatmeal produced greater gains the increased mash consumption and higher price per pound of gain made the ground oat ration more economical. The value of adding alfalfa leaf meal to the rations used in this test was a doubtful practice from the standpoint of both rate and economy of gain. Increasing the fiber content of the ration by substituting 5 per cent of bran for a like amount of barley reduced the gain and increased the cost of gain. A commercial mash compared favorably with other mixtures, but the cost of this mash made the cost per pound of gain very high.

The composition of vixen milk, E. G. Young and G. A. Grant (*Jour. Biol. Chem. 93 (1931), No. 2, pp. 805–810*).—An analysis of the milk of five vixens at Dalhousie University, Halifax, Canada, showed that on the average it contained 81.87 per cent of water, 18.13 per cent of solids, 6.25 per cent of protein, 6.3 per cent of fat, 4.56 per cent of lactose, and 0.96 per cent of ash. Calcium and phosphate made up about 74 per cent of the ash, but the variation was wide.

DAIRY FARMING—DAIRYING

[**Experiments in dairy production and dairying at the Ohio Station**] (*Ohio Sta. Bul. 497 (1932), pp. 108–120, 142, 143, 174, 175, figs. 6*).—In this report are published the results of feeding tests with dairy cattle, including a comparison of corn and wheat for milk production, by C. C. Hayden and C. F. Monroe; coconut meal and oil meals as protein supplements, by A. E. Perkins, M. A. Bachtell, and W. E. Weaver; fish meal and kelp v. cottonseed meal, by Monroe and Bachtell; dietary acidosis in dairy cattle, by Perkins and Monroe; fish meal for growing heifers and effect of iodized milk on growth of calves, by Monroe and W. E. Krauss; and fish meal in the dairy ration and soluble blood flour v. skim milk powder for calves, by Monroe, Krauss, Hayden, and H. Allen.

Dairying studies include the effect of high and low protein rations on the food value of milk, by Krauss and Hayden; raw v. pasteurized milk on the rate of development of anemia, by Krauss, J. H. Erb, and R. G. Washburn; the effect of irradiated ergosterol on vitamin D content of milk, by Krauss, R. M. Bethke, and Monroe; and vitamin B complex content of milk as influenced by the cow's feed, by C. H. Hunt, Krauss, and W. Wilder.

[**Studies with dairy cattle**] ([*Ohio Sta., Co. Expt. Farms Rpts.*] *1930, Belmont Co. Farm, pp. 1–3*).—Results are reported of a study on the effect of Manamar on milk production, the iodine content of milk, and the health of dairy cows.

[**Experiments with dairy cattle**] (*South Dakota Sta. Rpt. 1931, pp. 21, 22*).—This report includes progress notes on the influence of sunlight on the growth and health of dairy heifers, the effect of exposure to sunshine on the vitamin D content of milk, crossbreeding tests, and a comparison of skim milk with and without foam for feeding dairy calves.

Palatability of native hay for dairy cattle (*Wyoming Sta. Rpt. 1931, pp. 16–19*).—Continuing this study (E. S. R., 65, p. 171), H. S. Willard compared the daily consumption of wire grass and sedge from four ranches by dairy cattle.

Relation of the method of watering dairy cows to their water consumption and milk production, T. E. Woodward and J. B. McNulty (*U. S. Dept. Agr., Tech. Bul. 278 (1931), pp. 14*).—This test was divided into 3 90-day experimental periods, each of which was further divided into 3 30-day periods. The effect of frequency of watering on the quantity of water drunk, on the quantity of milk produced, and on the weight of the cows was determined. Complete records were obtained on 16 cows.

Cows having free access to water produced 2.8 per cent more milk and 2.1 per cent more butterfat than those watered twice a day, while the animals watered in the latter manner produced 1 per cent more milk and 1.4 per cent more butterfat than those watered once a day. Cows drank 1.5 per cent more water when permitted to drink twice a day than when they were drinking at will and 13.8 per cent more than when watered once a day. The increase

in milk production due to more frequent watering was more marked with good-producing cows than with low producers.

When producing 15 lbs. or more of milk per day cows seldom refused to drink when watered twice daily, and low producers refused water more frequently than good producers. Atmospheric temperature largely regulated the number of drinks per day. On similar rations cows drank 79.1 per cent more water in hot than in cold weather. In moderate weather they drank about as much as in cold weather. Even low-producing animals usually wanted water after eating hay. As the succulent material in a ration increased the quantity of water drunk decreased. Replacing silage with turnips resulted in a greater total ingestion of water.

The contribution of the dam in inheritance of milk and butterfat, L. Copeland (*Jour. Dairy Sci., 14 (1931), No. 5, pp. 379–393, figs. 6*).—In this study the data used were obtained from the Register of Merit of the American Jersey Cattle Club, in which 694 cows were listed as having production records themselves and also at least one tested daughter and one Register of Merit son. The highest record for each cow was converted to a mature 365-day basis, the records for the daughters were converted to a uniform age basis, and the highest records of the sons' daughters were computed to a mature 365-day basis.

These comparisons showed some relationship between a cow's producing ability and the producing ability of her daughters. In general the daughters showed about 32 per cent as much variation from the breed average as did the dams. A slight correlation was found between the dam's record and the records of her sons' daughters. Some correlation was shown between the average production of the dam's half-sisters by the same sire and the average production of the dam's sons' daughters. These records indicate that in choosing any untried young bull attention should be given to the fact that he is sired by a proved bull whose daughters are uniformly high producers and superior to their dams and also to the records of the dam, her sisters, and her daughters.

Uniform rules for the herd test, E. L. Anthony and J. B. Fitch (*Jour. Dairy Sci., 14 (1931), No. 5, pp. 394–397*).—The rules adopted by the American Dairy Science Association regarding uniform herd tests in connection with the new Herd Improvement Tests are given in this article.

Sources of some abnormal flavors in milk, G. M. Trout (*Michigan Sta. Quart. Bul., 14 (1932), No. 3, pp. 141, 142*).—A total of 122 samples of milk were scored for undesirable flavors. The causes of off flavors could be divided easily into four distinct classes, namely, advanced stage of lactation, feeding strong flavored feeds previous to milking, improper cooling, and either poor pasteurizing equipment or improper pasteurization.

Malt flavor in raw milk produced by micrococcus, P. H. Tracy and R. J. Ramsey (*Jour. Dairy Sci., 14 (1931), No. 5, pp. 457–462, fig. 1*).—Data are presented in this paper from the Illinois Experiment Station to show that an objectionable malt flavor in milk may be caused by a micrococcus of the aureus type. When an organism of the *Bacillus subtilis* group was also present, a markedly pronounced malt flavor resulted. Acid-forming bacteria retarded the development of the defect.

This off flavor was found to be rather common in raw milks entering certain milk plants during the summer, but not all samples containing the suspected organisms had the off flavor upon arrival. In some cases the flavor disappeared from samples held at room temperatures.

Utensils were found to be a direct source of the large rod organisms, while the coccus forms were found in the udders of cows. Neither of these organisms produced gas, and both were proteolytic in their action. Pasteurization at 142° F. destroyed pure cultures of the coccus organism in 20 minutes, while the rod-shaped organisms survived even higher temperatures.

This flavor defect developed most rapidly in milk held at from 85 to 100°, although a more characteristic flavor developed at a holding temperature of 68°. When milk was held at 60° this off flavor failed to appear in 3 days.

The solubility of metals in milk.—I, The solubility of copper under various conditions, H. T. GEBHARDT and H. H. SOMMER (*Jour. Dairy Sci., 14 (1931), No. 5, pp. 416–445, figs. 5*).—The work reported in this paper from the Wisconsin Experiment Station was undertaken to review the findings of previous investigators, to accumulate data on the solubility of copper in milk under various conditions, to determine the cause of reduced solubility of copper in milk at temperatures above the point of maximum solubility, and to gain a better understanding of the processes involved in the solution of copper in milk.

A review of the previous work indicated that the lack of agreement in results was due to faulty procedure, and in this work these objections were overcome. The study included investigations on the effect of acidity, dissolved gases, and temperature on the solubility of copper, and while the effect of velocity was not studied it was controlled and kept uniform.

High acidities markedly decreased copper solubility, while slight increases had no effect. Bubbling gases through milk showed that carbon dioxide markedly decreased, air slightly increased, and oxygen markedly increased copper solubility. Prolonged treatment of the milk with oxygen previous to exposure led to the formation of a protective oxide covering. Maximum solubility was always found at 70° C. whether the exposure was 30 minutes or longer. In high acid milk the maximum was also at 70°, but was appreciably lower than in sweet milk. Copper solubility was about the same at boiling temperature as at room temperature. Up to 50° the temperature-copper-solubility curve followed the temperature-reaction-velocity curve, but at higher temperatures less than the expected amount of copper was dissolved.

Preheating milk to temperatures above 70° reduced copper solubility in such milk, and the effect of preheating was greater as the time and temperature of preheating increased. The oxygen-reduction potential of milk was found to be related to the solution rate of copper and the factors that affect it. The oxygen-reduction potential remained practically constant up to a temperature of about 65°, and above 70° decreased rapidly. The potential remained constant with prolonged heating at 60 and 70°. The presence of dissolved copper made the potential more positive, while increased acidity made it more negative. The discussion shows how the oxidation-reduction potential may explain the mechanism through which acidity, dissolved gases, temperature, and preheating affect copper solubility.

Copper solution in milk is a typical case of metal corrosion, and the same factors in the same relative order of importance apply to copper corrosion in milk as apply in general to metal corrosion by weakly acid or alkaline solutions.

Effect of plant arrangement, equipment, and methods of operation in relation to breakage of bottles in milk plants, C. E. CLEMENT, J. B. BAIN, and F. M. GRANT (*U. S. Dept. Agr., Tech. Bul. 280 (1932), pp. 29, figs. 4*).—Observations were made in a large number of dairy plants having various arrangements and using different types of bottle-washing equipment to determine when and where during the course of handling breakage occurs. Broken glass

was collected so far as possible after each operation in the plant and weighed, and the breakage was expressed in pounds of glass per 1,000 bottles handled.

The plant arrangement and the equipment used largely determined the bottle breakage. A large proportion of chipping which caused many bottles to be discarded occurred on routes, especially those having wholesale deliveries. Size of plant and distance the bottle traveled in the plant were not factors in the amount of breakage.

A close relationship was found between the number of transfers from floor to floor in the plant and the amount of breakage. The breakage before washing and the total breakage were both greater when trucks were used to transfer the bottles from the checking-in platform to the washer than when conveyors were used and there was a minimum amount of stacking. Plants using gravity conveyors and transferring bottles for considerable distances had heavier breakage than plants using power conveyors. Where the conveyors were convenient for workers there was less breakage than where they were not convenient. Keeping the conveyor in the milk storage room well lubricated and in good repair was an important factor in keeping down breakage, as was also a minimum amount of handling of bottles.

Where a direct system of washing and filling bottles was used, the breakage was less than where a semidirect or an indirect system was used. Wide and rapid changes in temperature were important factors in breakage, and worn cases with slack cross wires and sagging bottoms caused some breakage where the handling was rough. Bottles ranked in the following order of breakage: Quarts, jars, and pints. In small plants breakage as a rule was lower than in large plants.

This study showed that the human element, plant arrangements, and types of equipment were important factors in bottle breakage.

Preliminary studies of churn sanitation, H. B. Morrison, Jr., H. Macy, and W. B. Combs (*Jour. Dairy Sci., 14 (1931), No. 5, pp. 404–415*).—The Minnesota Experiment Station undertook to determine the most desirable and the most satisfactory method of treating churns to remove or control contaminated areas. A churn which had not been used for some time and which showed visible mold growth at various places on the inner surface was selected for the study. In addition broth cultures of several organisms were introduced into the churn and were allowed to grow several days before the control treatments began. Autoclaved skim milk was used for rinsing the churn after the different treatments, and samples from this rinse were plated directly, using whey agar as the culture medium.

Partially filling the churn with water at 96° C. and revolving for 30 minutes was found to destroy surface molds. This treatment was most effective when carried out daily. Steam when used for sufficient periods was effective against molds, but caused blistering of the paint on the churn. Solutions of sodium hypochlorite, alkaline crystalline hypochlorite, and chloramine-T were ineffective in controlling molds, and none of the treatments were especially effective against bacteria.

The churn as a source of molds in butter, H. Macy, W. B. Combs, and H. B. Morrison, Jr. (*Jour. Dairy Sci., 14 (1931), No. 5, pp. 398–403*).—A study was undertaken at the Minnesota Experiment Station to determine the presence or absence of molds in various places in churns. Two churns were available, one of which had been used for 10 years in a creamery where considerable difficulty with mold had been experienced and the other from the station creamery where it had been in daily use for 7 years. A total of 230 samples were taken from various parts of the first churn and 78 samples from the

second churn. The samples were placed in jars or tubes and immersed overnight in sterile water. Platings of 1 cc of this water were made and poured with acidulated whey agar.

Of the samples obtained from the first churn 192 carried molds, while only 22 samples from the second churn showed any signs of being contaminated with molds and only 5 of these produced more than 2 mold colonies on plating. In the first churn 18 different genera of molds were isolated, many of which had been reported as having been isolated from butter, while only 5 genera were found in the second churn. It was concluded that the churn may be an important source of mold in butter.

Controlling sandiness in ice cream by using a combination of sugars, J. H. Erb (*Ice Cream Trade Jour.*, *27* (*1931*), *No. 8, pp. 35, 36*).—This study was carried out with ice cream mixes of high lactose concentration and the time determined for the ice cream to become sandy when various sugars were added. The check mix was made up of 10 per cent of fat, 17 per cent of serum solids, 15 per cent of sucrose, and 42 per cent of total solids. This mix contained 8.3 per cent of lactose, which was sufficient to produce crystals after the ice cream was a few days old. In one series of tests 25 per cent of dextrose, 30 per cent of maltose sirup, and 25 per cent of invert sugar replaced like quantities of sucrose, while in a second series 12, 15, 18, and 20 per cent of sucrose was used and the fat content of this series was reduced as the sugar content increased in order to control the water content.

It was found that such sugars as dextrose, maltose, and invert sugar had no beneficial effect on lactose crystallization or upon sandiness. Increasing the sucrose content of the mix and keeping the water content constant tended to retard the formation of lactose crystals.

In another part of this work dealing with the crystallization of lactose from supersaturated aqueous solutions and with lactose in solutions of sucrose, dextrose, and maltose, it was found that all samples crystallized at about the same rate and to the same final extent. Dextrose and maltose did not appear to check the crystallization.

VETERINARY MEDICINE

[Report of work in animal pathology and parasitology] (*Ohio Sta. Bul. 497* (*1932*), *pp. 123–125, 138–142*).—Accounts are given of a comparison of the tube and rapid agglutination tests for Bang disease, by B. H. Edgington and [C. J.] Wallen, and an intradermal test for detecting Johne's disease of cattle, by A. Broerman and Fogle. Reports of work on the transmission of avian coccidiosis, by Edgington and [E. D.] Martin; on nicotine in the control of avian coccidiosis, by R. E. Rebrassier; on a respiratory disease of chicks, by Broerman and Martin; and on the effect of chemical agents on ova of *Ascaridia lineata*, on food requirements for the larvae of *Oesophagostomum columbianum*, and on the efficiency of kamala as an anthelmintic for tapeworms in poultry, all by Rebrassier, follow.

[Report of work in animal pathology, pharmacy, and parasitology] (*South Dakota Sta. Rpt. 1931, pp. 17, 18, 31–41*).—The work of the year for which results are reported includes that with so-called "alkali disease" in hogs, cattle, horses, etc.; on the growth, distillation, and physical constants of several varieties of chenopodium; on the treatment of ascarids in pigs; on an investigation of anthelmintic values of oil of chenopodium on domestic animals, including sheep, chickens, and cattle; and on the effect of "alkalied" grain on growing chicks and poultry.

[Report of work in animal pathology] (*Wyoming Sta. Rpt. 1931, pp. 22–24, 36, 38*).—Brief reference is made to work with death camas as a poisonous plant, by O. A. Beath, and on the effect of feeding timber milk vetch (*Astragalus campestris*) to sheep, by W. R. Smith. Work by C. Elder with infectious abortion of cattle and calf diphtheria is briefly noted, as is also work with swamp fever in horses.

Seventeenth report of the director of veterinary services and animal industry, I, II, P. J. du Toit et al. (*Union So. Africa Dept. Agr., Rpt. Dir. Vet. Serv. and Anim. Indus., 17 (1931), pts. 1, pp. 3–429, pls. 7, figs. 178; 2, pp. 495–659, pls. 2, figs. 47, pp. 705–768, figs. 10*).—The contributions on animal pathology presented in this annual report (E. S. R., 64, p. 770) are as follows: Immunity in East Coast Fever, by P. J. du Toit (pp. 3–25); Treatment of Piroplasmoses with T. 21, by B. S. Parkin (pp. 27–43); Blood Parasites of Game in Zululand, by W. O. Neitz (pp. 45–60); Antimony Therapy in *Trypanosoma brucei* Infection of Horses (pp. 61–65), Antimosan Therapy in *Trypanosoma congolense* Infection of Sheep (pp. 67–76), Styrylquinoline No. 314 in Trypanosomiases (pp. 77–82), and A Note on the Diagnosis of Bovine Trypanosomiasis (pp. 83–86), all by B. S. Parkin; Heartwater—The Present State of Our Knowledge of the Disease, by R. A. Alexander (pp. 89–150); An Attempt to Attenuate the "Virus" of Heartwater by Passage, by P. J. du Toit and R. A. Alexander (pp. 151–160); The Microscopic Diagnosis of Heartwater—A Preliminary Note on the Value of Intima Smears, by C. Jackson (pp. 161–173); A Rickettsia-like Organism in the Conjunctiva of Sheep (pp. 175–186) and An Unknown Intracellular Organism of the Conjunctival Epithelium of Sheep—Preliminary Report (pp. 187–189), both by J. D. W. A. Coles; Black Quarter and Malignant Oedema—A New Method for the Preparation of a Bivalent Vaccine against *B[acillus] chauvaei* and *Vibrion septique*, by J. R. Scheuber (pp. 193–196); *Vibrio foetus* as a Cause of Bovine Abortion in South Africa, by P. S. Snyman (pp. 197–203); Investigations into the Cause and Transmission of Lumpy Wool Affecting Merino Sheep and Its Treatment, by D. G. Steyn (pp. 205–213); Actinobacillosis and Other Complications in Sheep Which May Arise from the Feeding of Prickly Pear (*Opuntia* spp.), by A. D. Thomas (pp. 215–229); Wild Antelopes as Carriers of Nematode Parasites of Domestic Ruminants, Part I (pp. 233–254), The Specific Diagnosis of Nematode Infestation in Sheep (pp. 255–266), The Development of Nematode Eggs and Larvae in Cattle Dung—Preliminary Report (pp. 267, 268), A Second Species of the Nematode Genus Acanthoxyurus [*A. shortridgei*] (pp. 269–272), Two New Species of the Nematode Genus Hartertia [*H. zuluensis* and *H. natalensis*] (pp. 273–276), and Two New Nematodes from the Suricat (Viverridae) [*Habronema whitei* and *Numidica suricattae*] (pp. 277–282), all by H. O. Mönnig; New Genera and Species of Mallophaga, by G. A. H. Bedford (pp. 283–297); A Study of the Sheep Blow-Flies of South Africa, by B. Smit (pp. 299–421); The Toxicity of the Pupae of the Moth *Nudaurelia cytherea*, by D. G. Steyn (pp. 423–429); The Haematology and Pathology of Haemonchosis in Sheep, by P. J. J. Fourie (pp. 495–572); Studies on the Blood of Mice, by G. van der W. de Kock (pp. 573–615); Studies on the Aetiology of Dunsiekte or Enzootic Liver Disease of Equines in South Africa, by G. de Kock, P. J. du Toit, and D. G. Steyn (pp. 617–644); The Photosensitising Influence of Haematoporphyrin on Sheep and Goats, by J. I. Quin (pp. 645–659); and Recent Investigations into the Toxicity of Known and Unknown Poisonous Plants in the Union of South Africa (pp. 707–727) and Investigations into the Cause of Alopecia (Kaalsiekte) in Kids and Lambs (pp. 729–768), both by D. G. Steyn.

Studies of normal blood pressure in animals.—I, Blood pressure in the horse, with brief note on the ox, N. G. COVINGTON and G. W. MCNUTT (*Jour. Amer. Vet. Med. Assoc., 79 (1931), No. 5, pp. 603–624, figs. 8*).—In determinations made at Pullman, Wash., of the normal blood pressure of 224 apparently healthy animals, the systolic pressure of geldings and stallions fluctuated between 90 and 104 mm of mercury, with an average of 98, and that of the mare fluctuated between 86 and 98 mm, with an average of 90. The number of mares examined was somewhat smaller than the number of males, but a consistently lower reading was obtained in the female. The effect of castration, if any, was not determined. Diastolic pressure was variable, with a difference of from 30 to 45 mm of mercury lower than systolic pressure.

Microbic dissociation in the Brucella group, M. S. MARSHALL and D. JABED (*Jour. Infect. Diseases, 49 (1931), No. 4, pp. 318–336, fig. 1*).—The authors have found it possible, by means of prolonged cultivation on agar containing specific antiserum and repeated selection, to secure rough types of most, and probably all, strains of Brucella. The induced rough forms are relatively stable. The shift from rough to smooth appears continuous rather than discontinuous.

Lethal temperatures for porcine strains of Brucella abortus, with special reference to pasteurization, R. A. BOAK and C. M. CARPENTER (*Jour. Infect. Diseases, 49 (1931), No. 6, pp. 485–488*).—Following a review of the literature, the authors report upon experimental observations which indicate that the present requirements for the pasteurization of milk, namely, heating at from 142° to 145° F. for from 20 to 30 minutes, are adequate for destroying the most virulent strains of *B. abortus*.

Study of anti-hog cholera serum and virus for the presence of Brucella, I. F. HUDDLESON and H. W. JOHNSON (*Jour. Amer. Vet. Med. Assoc., 79 (1931), No. 5, pp. 635–637; abs. in Michigan Sta. Quart. Bul., 14 (1932), No. 3, p. 217*).—In investigational work at the Michigan Experiment Station a search was made of 31 serial-lot samples of clear anti-hog-cholera serum, 43 serial-lot samples of whole-blood serums, and 59 serial-lot samples of hog-cholera virus for the presence of viable *B. suis*. The samples were collected in two seasons of the year—summer and winter—and came from widely distributed manufacturers.

"In not a single sample of serum or virus could viable *B. suis* be detected, either by bacteriological examinations or animal inoculations. Whole-blood samples from 100 hogs on farms in Michigan that reacted to the agglutination test in high titer have been examined for the presence of *B. suis*. The examination of these samples failed to reveal the presence of the organism." It is pointed out that while it can not be said with certainty that *B. suis* never occurs naturally in commercial anti-hog-cholera serum and virus, the examinations made would strongly indicate the possibility of its presence in a living state at the time of distributon is rather remote.

The results of exposing cows to spontaneous Brucella-reacting sows, R. GRAHAM and F. THORP, JR. (*North Amer. Vet., 13 (1932), No. 1, pp. 32, 33–38, fig. 1*).—In the experiments conducted a small percentage of the nonreacting cattle, during 28 months' exposure contact to reacting sows and premises of reacting sows, gave a temporary positive agglutination test for Bang's disease. Nonreacting goats and nonreacting sows exposed for shorter periods of time gave negative reactions. One mare gave a suspicious titer for 5 months and then became negative.

The transmission of "louping-ill" to the mouse and the monkey: Histology of the experimental disease, E. W. HURST (*Jour. Compar. Path. and

Ther., *44 (1931), No. 4, pp. 231–245, pl. 1, figs. 8*).—The disease of the sheep met with in Great Britain known as "louping ill," a recent study of which by Alston and Gibbon has been noted (E. S. R., 66, p. 469), was found by the author to be transmissible to the mouse and to the monkey. "In the mouse, among the rather variable symptoms, paralysis and incoordination takes a prominent place. The lesions are of the nature of a diffuse encephalomyelitis with mild meningeal involvement. In four monkeys, a progressive ataxia of cerebellar type was the dominant clinical feature. Histologically a more or less diffuse encephalomyelitis is accompanied by massive destruction of the Purkinje cells of the cerebellum. The analogy to the destruction of the anterior horn cells in poliomyelitis is drawn. In the mouse, but not in the monkey, intracytoplasmic bodies believed to be of the nature of inclusion bodies are found in the nerve cells."

The occurrence of Bact. tularense in the eastern wood tick, Dermacentor variabilis, R. G. GREEN (*Amer. Jour. Hyg.*, *14 (1931), No. 3, pp. 600–613*).—Studies are reported in which *Bacterium tularense* was isolated directly from the American dog tick by guinea pig inoculation and subsequent culture. Over an area of 20 square miles in central Minnesota the percentage of American dog tick infection was found to be less than 0.1 during the summer of 1930. The animal culture derived from ticks was of low virulence, as indicated by the type of lesion produced and by failure consistently to produce fatal infections in rabbits.

Bovine infectious abortion or Bang's disease of cattle, C. A. MITCHELL (*Canada Dept. Agr. Bul. 150, n. ser. (1931), pp. 15, figs. 3*).—A practical account.

The effect of metaphen on the agglutinin titre of cows suffering from Bang's disease, W. A. JAMES and R. GRAHAM (*Jour. Amer. Vet. Med. Assoc.*, *79 (1931), No. 4, pp. 554–556*).—No significant change was noticed in the agglutinin titer of animals injected intravenously with metaphen, nor were any ill effects observed.

Control of rinderpest, C. S. GIBBS, C. KEN, and S. PIAO (*Lingnan Sci. Jour.*, *8 (1929), pp. 59–71, figs. 4*).—This is a review of the results of certain laboratory studies on rinderpest control measures, made in an attempt to separate scientific facts established by control experiments from theories founded on empiricism.

Ovine and bovine strains of B. chauvoei, R. S. ROBERTS (*Jour. Compar. Path. and Ther.*, *44 (1931), No. 4, pp. 246–251*).—The author reports upon the antigenic structures of ovine and bovine strains of *B[acillus] chauvoei* as based upon agglutination reactions, absorption of agglutinins, and observation of the effect of heat on the antigen. "The results obtained indicate that *B. chauvoei* possesses 'O' and 'H' agglutinins; that the 'O' component is common to strains isolated from sheep and cattle, but that the 'H' component is specific to each type, ovine and bovine. Ovine and bovine strains form two distinct 'groups' of the bacterial species of *B. chauvoei*. Immune serum derived from bovine strains is likely to confer protection against infection with the bovine type."

Control of stomach worms in sheep: Administration of drugs in drinking water (*Jour. Council Sci. and Indus. Research [Aust.], 4 (1931), No. 1, pp. 55, 56*).—In the experiments aimed at the determination of the practicability of administering drugs with drinking water for the control of internal parasites, especially stomach worms of sheep, potassium permanganate was administered to sheep daily for 6 months in the drinking water at strengths of 1 to 2,500 and 1 to 5,000 without beneficial results. While a 1 to 4,000 watery suspension of carbon tetrachloride similarly administered appeared to exert

some action against stomach worms when given daily over a long period, there was evidence that it had definitely harmful effects on the livers of treated sheep, and its use in drinking water could not be recommended.

Black disease in Tasmania, D. T. OXER (*Jour. Council Sci. and Indus. Research [Aust.], 4 (1931), No. 1, pp. 36–44*).—In his study of black disease of sheep, due to *Bacillus oedematiens* and marked by its seasonal occurrence, by the suddenness with which death occurs, and by the rapidity of post-mortem decomposition, the author found the anaculture vaccine that is being used for prophylaxis in the field, and prepared strictly according to the method of Turner (E. S. R., 60, p. 179), to be capable, even when 8 months old and in single doses of 2 cc, of immunizing guinea pigs against 100 m. l. ds. of culture given subcutaneously.

B. paludis (McEwen)—a comparison with the lamb dysentery bacillus, J. H. MASON, H. E. ROSS, and T. DALLING (*Jour. Compar. Path. and Ther., 44 (1931), No. 4, pp. 258–265*).—The authors' studies have shown *B[acterium] paludis* toxin to be much more potent than that of *B[acillus] welchii*. *B. paludis* antitoxin neutralizes its own toxin as well as that of *B. welchii*. *B. paludis* liquefies solid serum and clots alkaline egg. It is pointed out that in these respects and serologically *B. paludis* and lamb dysentery bacillus appear to be identical, the only difference being that *B. paludis* (like *B. welchii*) produces acid when grown in glycerine and yields aldehyde and acrolein.

Diseases and ailments of swine, J. WALKER (*Kenya Colony Dept. Agr. Bul. 15 (1931), pp. [1]+36, pls. 4*).—A practical account as related to conditions in Kenya.

Hog cholera, C.-S. LO (*Lingnan Sci. Jour., 8 (1929), pp. 45–57, figs. 6*).—A brief account of this disease as related to its occurrence and control in China.

The results of feeding various members of the colon-typhoid-enteritidis group of organisms to anemic and non-anemic pigs, J. F. BULLARD (*Jour. Amer. Vet. Med. Assoc., 79 (1931), No. 5, pp. 625–630*).—In a study made at the Indiana Experiment Station the presence of agglutinins for various members of the paratyphoid-enteritidis group of organisms was found to be comparatively rare in the blood serum of young pigs. "After the feeding of *Salmonella aertrycke* and *S. enteritidis*, agglutinins appeared earlier in anemic than non-anemic pigs. This is probably due to the ability of the organisms to penetrate the intestinal mucosa as a result of lowered resistance caused by anemia. *S. aertrycke* and *S. enteritidis* were nonpathogenic for all pigs, while *S. suipestifer* was extremely virulent."

The value of sterile bacterial suspensions and sterile broth cultures in preventing the development of lesions in small pigs attributable to Salmonella suipestifer.—A Preliminary report, J. F. BULLARD (*Jour. Amer. Vet. Med. Assoc., 79 (1931), No. 5, pp. 631–634*).—In work at the Indiana Experiment Station the injection of sterile, phenolized, saline suspension of *S. suipestifer* was the most rapid and reliable method of stimulating the production of agglutinins for this organism in young pigs, while the feeding of the formolized killed cultures was variable in this action. "The feeding of live cultures after the injection of the bacterial suspension or after the feeding of killed cultures did not materially increase the titer. Lesions attributable to *S. suipestifer* were found in only one case out of six where a preliminary injection was carried out. *S. suipestifer* was not isolated from this case. However, it was isolated from the cecal lymph glands of two other pigs in this group. Pigs fed living cultures, after being fed killed cultures, showed no lesions

of colitis. All organs of these pigs were sterile. One pig of this group, however, was positive when cultured. This occurred before the living culture was fed."

The kidney worm of pigs: Its growing importance to Australia, I. C. Ross (*Jour. Council Sci. and Indus. Research [Aust.], 4 (1931), No. 1, pp. 30–33, pl. 1*).—This is a brief summary of information on *Stephanurus dentatus*, said to be firmly established on the east coast of Australia as far south at least as Sydney.

African horse sickness as observed particularly in Egypt and in Erithrea, M. Carpano, trans. by E. Talarewitch (*[Egypt] Min. Agr., Tech. and Sci. Serv. Bul. 115 (1931), pp. 41, pls. 4*).—This is a report of observations in Egypt and Erithrea of African horse sickness, also known as equine pest, a disease which was introduced into Egypt from the Sudan.

Horse sickness, J. Walker (*Kenya Colony Dept. Agr. Bul. 20 (1931), pp. [1+15], figs. 2*).—A practical account.

Poultry disease prevention and eradication, I, II, F. R. Beaudette (*New England Poultryman, 13 (1931), No. 6, pp. 28, 30, 31, 51, 52, 54, fig. 1; 14 (1932), No. 1, pp. 10–12, 33, 41*).—A practical discussion contributed from the New Jersey Experiment Stations.

Diseases affecting poultry in Kenya, J. R. Hudson (*Kenya Colony Dept. Agr. Bul. 16 (1931), pp. [1]+27, pl. 1*).—A practical account.

Intestinal coccidiosis, C. B. Hudson (*New Jersey Stas. Hints to Poultrymen, 20 (1932), No. 5, pp. 4*).—A brief description given of the four species of intestinal coccidia of the common fowl, namely, *Eimeria mitis, E. acervulina, E. maxima*, and *E. necatrix*, is followed by practical notes on self-limitation of infection, importance of dosage, immunity, intestinal coccidiosis and fowl paralysis, treatment, and control.

Quantitative and statistical analyses of infections with Eimeria tenella in the chicken, F. Fish (*Amer. Jour. Hyg., 14 (1931), No. 3, pp. 560–576, figs. 3*).—An intensive daily study of the number and size of oocysts obtained from each of seven Barred Rock chickens during the entire patent period of an acute infection with *E. tenella* is reported upon. Varying infecting doses, from 7 to 630 segmented oocysts each, were administered to the hosts, and the differential effect on the resulting infections observed.

It was found that "the prepatent period for *E. tenella* infections is 160 to 165 hours, regardless of the size of the infecting dose. An increase in the size of the infecting dose has a directly proportional effect on the resulting asexual infection and on the clinical symptoms of the disease. An increase in the infecting dose has a noticeably direct influence on the total number of oocysts passed by the host during the resulting patent period. The size of the infecting dose has no effect on the daily oocyst production, the height of the peak of the resulting infection, nor upon the duration of the patent period."

Chronic pullorum disease in an adult hen, A. J. Durant and H. S. McDougle (*Jour. Amer. Vet. Med. Assoc., 79 (1931), No. 5, pp. 646–648, fig. 1*).—This is a report of a case of chronic pullorum disease of the heart sac, which is a fairly common form of the disease affecting adult fowls.

The specificity of avian tuberculin reactions, V. B. Dolgopol (*Jour. Infect. Diseases, 49 (1931), No. 3, pp. 216–224*).—The results obtained in inoculation of chickens with sputum from 10 human reactors to avian tuberculin led to the conclusion that a positive reaction to avian tuberculin as observed in many cases of pulmonary tuberculosis does not indicate an active mixed infection with human and avian tubercle bacilli. The inoculation of chickens with autopsy material from 8 patients reacting to avian tuberculin led to the con-

clusion that a positive reaction to avian tuberculin in pulmonary tuberculosis does not indicate latent infection with the avian tubercle bacillus. It is concluded that tuberculosis does not develop in chickens when they have been inoculated intravenously or intraperitoneally with large amounts of mammalian tubercle bacilli.

Pasty eyes in ducklings, H. J. STAFSETH (*Jour. Amer. Vet. Med. Assoc., 79 (1931), No. 5, pp. 638–640; abs. in Michigan Sta. Quart. Bul., 14 (1932), No. 3, p. 217*).—This is an account of an outbreak of a disease in ducklings which occurred in a large duck-raising establishment in Michigan, characterized by so-called "watery eyes," "pasty eyes," or "scaly eyes." The negative results of the bacteriological work and the strikingly gradual and regular improvement following the change in the feed of the breeding stock indicated that this disease might be of nutritional origin.

Arthritis and periostitis in pheasants caused by Staphylococcus pyogenes aureus, N. HOLE and H. S. PURCHASE (*Jour. Compar. Path. and Ther., 44 (1931), No. 4, pp. 252–257, fig. 1*).—A disease affecting the joints and bones of young pheasants on an estate in North Wales was investigated and discovered to be due to infection with *S. pyogenes aureus*. It was found that *S. pyogenes citreus* may rarely also assume the rôle of causative agent. A peracute septicemic form, with no joint lesions, was occasionally met with. The organisms appeared to be disseminated primarily by the blood stream, the disease resolving itself either into an acute septicemia or a chronic arthritis. The reasons for this opinion are that birds dying in plump condition of septicemia showed no lesions, that birds showing joint lesions were poor or emaciated, and that joints of the wings as well as joints of the leg were frequently found affected. Infection by wounds seemed the most probable route, and thistles were suspected as being the wounding agents. Efforts at immunization were not successful, but the subject was not thoroughly investigated as protective inoculation did not appear feasible from the practical standpoint.

The new anthelmintic medications [trans. title], A. HENRY (*Rec. Méd. Vét., 107 (1931), No. 11, pp. 730–762*).—This is a review of the present knowledge of the value of anthelmintics, much of the information as relates to the equine, bovine, sheep, goat, hog, rabbit, dog, cat, and poultry being summarized graphically in tabular form.

AGRICULTURAL ENGINEERING

Agricultural engineering, S. J. WRIGHT (In *Agricultural Research in 1930. London: Roy. Agr. Soc. England, 1931, pp. 81–107*).—This contribution from the Institute for Research in Agricultural Engineering of Oxford University is a review of the progress of research in agricultural engineering, more especially in European countries during 1930. It contains sections on the testing of agricultural machinery, drainage, power, and agricultural implements.

[Agricultural engineering investigations at the Ohio Station], H. L. BORST, J. S. CUTLER, L. E. THATCHER, E. A. SILVER, [I. P.] BLAUSER, G. W. MCCUEN, N. R. BEAR, V. L. OVERHOLT, and H. R. HOYT (*Ohio Sta. Bul. 497 (1932), pp. 27–29, 31, 32, 157–166, 169, 170, figs. 8*).—Progress results of investigations are reported on the furrow grain drill v. the ordinary drill for wheat; power requirements of a threshing machine; weed control in soybeans; rate of drying of grain in windrows, shocked, and uncut; combining on side hills; weed control in open drainage ditches; the effect of joint space on the efficiency of tile drains; plow draft; and power requirements of grinding red and white varieties of oats.

[Agricultural engineering investigations at the South Dakota Station] (*South Dakota Sta. Rpt. 1931, pp. 8–11*).—The progress results are presented of studies on the use of the combine harvester-thresher, the development of corn harvesting machinery, and the use of rammed earth for farm building walls.

Surface water supply of Pacific slope basins in Oregon and lower Columbia River Basin, 1929 (*U. S. Geol. Survey, Water-Supply Paper 694* (*1932*), *pp. VI+154, fig. 1*).—This report presents the results of measurements of stream flow during the year ended September 30, 1929.

[Irrigation investigations at the New Mexico Station] (*New Mexico Sta. Rpt. 1931, pp. 63–72*).—The progress results are presented of investigations conducted in cooperation with the U. S. D. A. Bureau of Agricultural Engineering on duty of water for grapes (E. S. R., 65, p. 435), cabbage, and onions, on the rate and cause of rise of ground water in the Mesilla Valley, on the irrigation and duty of water for potatoes, on water requirements, and the economical use of water for cotton and other crops, on rainfall supplemented by underground water in the production of crops of low water requirements, and on the duty of water for pinto beans.

The influence of irrigation head and length of run on the use of water for alfalfa, D. W. Bloodgood and A. S. Curry (*New Mexico Sta. Bul. 197* (*1931*), *pp. 10, fig. 1*).—This bulletin reports the results secured over a period of five years from irrigation studies conducted in cooperation with the U. S. D. A. Bureau of Agricultural Engineering on the use of water for alfalfa on Gila clay adobe soil.

The highest average yield per acre-inch was obtained from a 200-ft. plat using a 4-sec.-ft. head of water. The lowest yield was from a 600-ft. plat using a 3-sec.-ft. head of water. The highest average yield per acre-inch per acre, based on length of run, was obtained from the 200-ft. series, and the lowest from the 600-ft. series. The longer runs were inclined to use the larger amounts of water, although the yields were not affected to any great extent by the variations in the water applied. There was some indication that the shorter plats gave a higher yield per unit of water applied than the longer ones, and there was a tendency for the larger irrigation heads to use larger total seasonal amounts of water.

The size of irrigation head had no important influence on the yields, and apparently there was no indication of the existence of a direct relationship between the size of irrigation head and the yield per acre-inch.

Run-off investigations in central Illinois, G. W. Pickels (*Ill. Univ., Engin. Expt. Sta. Bul. 232* (*1931*), *pp. 134, figs. 38*).—Studies conducted by the station in cooperation with the U. S. D. A. Bureau of Public Roads are reported, the purpose of which was to determine (1) the roughness factor *n* in Kutter's formula for flow of water in open drainage channels in central Illinois, (2) the maximum discharge for which drainage channels in central Illinois should be designed, and (3) the annual yields of small watersheds, such as are found in central Illinois.

It was found that the minimum value of *n* which should be used in the design of drainage ditches in central Illinois is 0.040. This value obtains at high stages during the summer months in the best-maintained channels, where the bottom of the channel is clear of vegetation and the side slopes are covered with grass or low weeds but no bushes. This low value of *n* should not be used unless the channel is to be cleared annually of all weeds and bushes.

A value of *n* of 0.050 should be used if the channel is to be cleared in alternate years only. Large weeds and bushy willows 3 to 4 ft. high on the side

slopes will produce this value of *n*. In channels which are not cleared for a number of years the growth may become so abundant that values of *n* above 0.100 may exist. Trees 6 to 8 in. in diameter growing on the side slopes do not impede the flow so much as do small bushy growths, provided the lower, overhanging limbs are cut off.

The size of watershed did not seem to be as important for small watersheds as has generally been considered. Topography has a marked effect upon the rates of flood run-off, even from watersheds which are so flat as to require artificial drainage for successful agriculture. Completeness of drainage is an important characteristic. The more adequate the drainage facilities the greater the rate of flood discharge during excessive storm periods, especially those occurring during the winter and spring. Drainage ditches in central Illinois should be designed to carry maximum discharges of from 15 to 30 sec.-ft. per square mile of watershed area, depending upon the topography, completeness of drainage, and the degree of protection desired. It is believed that the higher value will not be exceeded on the average more often than once in 25 years.

It would appear, from watersheds similar to those studied, that the annual yield during the normal year should be from 9 to 11 in., that on an average of once in 10 years a yield as low as 7 in. may be expected, and that on an average of once in 20 years an annual yield as low as 6 in. may occur.

Public Roads, [March, 1932] (*U. S. Dept. Agr., Public Roads, 13 (1932), No. 1, pp. 20+[2], figs. 18*).—This number of this periodical contains the current status of Federal-aid road construction as of February 29, 1932, programs of estimated State and local highway and bridge expenditures for calendar year 1932, and the following articles: The Western States Traffic Survey, by L. E. Peabody (pp. 1–18); and Truck Great Factor in Farm Freighting (p. 19).

Investigation of loads on three cast iron pipe culverts under rock fills, M. G. Spangler (*Iowa Engin. Expt. Sta. Bul. 104 (1931), pp. 37, figs. 12*).—Results of studies are reported from which conclusive proof was obtained that the rock fills investigated acted in a manner analogous to an earth fill. Evidence is presented to show that the load on a culvert is not a direct function of the height of the embankment, but that the relative settlements of the culvert and various horizontal planes of the embankment must be taken into account if the loads are to be determined. It was found that maximum loads do not develop until a considerable time has elapsed after the embankment has been placed.

Laboratory tests of reinforced concrete arches with decks, W. M. Wilson (*Ill. Univ., Engin. Expt. Sta. Bul. 226 (1931), pp. 100, figs. 53*).—Tests of reinforced concrete arches and studies made with celluloid models are reported, and the results are presented in extensive detail.

Mechanical laboratory methods, J. C. Smallwood and F. W. Keator (*New York: D. Van Nostrand Co., 1931, 4. ed., pp. XII+386, figs. 121*).—This is the fourth revised edition of this book relating to laboratory methods and equipment for experimental work in mechanical engineering. Much of the information presented is directly applicable to experimental work in agricultural engineering.

Part 1 deals with the testing of experimental instruments and apparatus; part 2 with the analysis of combustion; part 3 among other things with the testing of prime movers, steam boilers, and refrigerating machinery; and part 4 with tests of miscellaneous equipment, such as hydraulic rams, hoists, and belt testers, and with hygrometry, lubricating oils, and electrical machinery. Appendixes are included on logarithms of numbers, diameters and areas of circles, weight of water, steam tables, and properties of ammonia; American

Society of Mechanical Engineers' code on definitions and values; and preparation of reports of engineering tests.

A. S. T. M. tentative standards, 1931 (*Philadelphia: Amer. Soc. Testing Materials, 1931, pp. 1008, figs. 177*).—This volume contains the 180 tentative specifications, methods of test, definitions of terms, and recommended practices in effect during 1931.

Report of Structural Steel Welding Committee of the American Bureau of Welding (*New York: Amer. Welding Soc., 1931, pp. 208, figs. 85*).—This report deals with the results of an investigation extending over a period of five years, the principal object of which was to determine the stresses that may be used safely in the designing of welded steel structures fabricated under ordinary fabricating shop conditions. A series of conclusions and recommendations are presented, and appendixes deal with analysis of bar steel, qualification of welders, filler metal, and design, fabrication, and test data for program specimens.

Effects of bending wire rope, F. C. Carstarphen (*Amer. Soc. Civ. Engin. Proc., 57 (1931), No. 10, pp. 1439–1466, figs. 11*).—This is a technical analysis of the effects of bending wire rope in which new and comprehensive formulas are presented. An appendix contains the nomenclature used.

Master specifications for good carpentry construction (*Amer. Builder and Bldg. Age, 52 (1932), No. 4, pp. 50–54, figs. 17*).—The text of these specifications is given, together with drawings and standard details for house framing.

Wheel and crawler type tractors in agriculture [trans. title], **Deubel** (*Fortschr. Landw., 6 (1931), No. 19, pp. 618–622, figs. 2*).—An analysis is given of the draft and other power requirements of German agriculture for the purpose of establishing the economic place of the tractor therein. This analysis shows that to utilize fully a general-purpose farm tractor on 100 ha (about 250 acres) it is necessary that fields and meadows be close together and that both be near the farm home. Where 300 ha are cultivated, the analysis indicates the need for two tractors.

The farm tractor in Minnesota, A. J. Schwantes and G. A. Pond (*Minnesota Sta. Bul. 280 (1931), pp. 67, figs. 14*).—The results of a survey of the tractor and its use as a source of power on 291 farms in Minnesota are reported.

Data were obtained from 314 tractors as used on dairy farms in the southeastern part of the State, on corn, beef cattle, and hog farms in the southwestern part, and on small grain farms in the northwestern part. The average sizes of farms in the three sections of the State were 214, 294, and 556 acres, respectively. No consistent relation was found between the size of farm and the size of tractor used, and tractor power constituted slightly more than half of the drawbar power.

The number of acres handled per drawbar horsepower was 14.7 in the southeast, 19.1 in the southwest, and 29.9 in the northwest. The average hours of use per tractor per year was 417, and approximately 75 per cent of all tractor work on the farms was drawbar work and 25 per cent belt work. The average cost per hour of operation was 74 and 96 cts. for the 2-plow and 3-plow tractors, respectively. An average net saving in man labor of 67 days per year after the purchase of a tractor was reported. Also an average decrease of 0.18 hour in the daily hours of work per man and an increase of 0.59 hour in the daily time spent in the field was estimated, as compared with the time so spent when the farms were operated with animal power. An average reduction of 33.8 per cent in the number of work horses was made possible on these farms by the use of the tractor. There

was an average reduction of 20 per cent in grain fed to work horses, 11 per cent in hay, and an increase of 29 per cent in pasture, and also an increase of 2.2 years in the working life of horses.

Vertical expansion of soils under the influence of cultivating implements [trans. title], M. RINGELMANN and J. BOURDELLE (*Ann. Agron.* [*Paris*], *n. ser., 1* (*1931*), *No. 1, pp. 82–93, figs. 4*).—This is a joint contribution from the Central Station for the Testing of Agricultural Machinery at Paris and the Central Station of Agricultural Physics of Versailles. It reports studies of the vertical swelling of a yellow silt soil high in lime and low in humus contents and of a black siliceous clay soil low in lime and high in humus contents, under the influence of spading and hoeing to a depth of 15 cm (6 in.). The results show a vertical swelling of the former soil varying from 14 to 23 mm and of the latter varying from 17 to 31 mm under the influence of spading.

Apparently moisture content and the presence or absence of gravel and stones, but not soil type, are the important factors in this influence of tillage.

Pumping machines and their motors [trans. title], A. BLANC (*Ann. École Natl. Agr. Montpellier, n. ser., 21* [*1931*], *No. 1, pp. 36–52*).—This is a technical analysis of pumps for the elevation of subterranean water for irrigation and of the adaptation of animal, wind, and mechanical motive power.

Ammeter and pressure gauge comparisons in the operation of the viscolizer (*South Dakota Sta. Rpt. 1931, p. 22*).—The electric power requirements in the operation of a viscolizer as measured by different instruments are compared against actual pressures registered on a liquid pressure gauge.

Electricity on the farm and in rural communities (revised edition), compiled by L. C. PRICKETT (*C. R. E. A. Bul.* [*Chicago*], *7* (*1931*), *No. 1, pp. 332, figs. 431*).—This is a contribution from the Committee on the Relation of Electricity to Agriculture. It presents material which represents a summary of the best available information at the command of the committee on the subject. Much of this material has been obtained from the State agricultural experiment stations.

The construction of cow-houses ([*Gt. Brit.*] *Min. Agr. and Fisheries Bul. 40* (*1931*), *pp. 22, pls. 2, figs. 9*).—This is a revision of an earlier publication (E. S. R., 53, p. 390), and gives practical information on the planning and construction of cattle barns from the English viewpoint. Suggested detailed drawings for specific structures are included, together with working plans for single- and double-range cow barns.

Apple storage ([*Ohio Sta., Co. Expt. Farms Rpts.*] *1930, Belmont Co. Farm, pp. 3, 4*).—Practical information is given on the planning and construction of an economical and efficient air-cooled apple storage as constructed on the experimental farm at a cost of about 10 cts. per bushel capacity.

Effect of priming-coat reduction and special primers upon paint service on different woods, F. L. BROWNE (*Indus. and Engin. Chem., 22* (*1930*), *No. 8, pp. 847–854, figs. 4*).—Studies conducted at the U. S. D. A. Forest Products Laboratory on the effect of methods of priming on the durability of paint coatings on seven species of softwoods are reported.

It was found that a marked variation in the proportions of linseed oil and of turpentine in the priming coat failed to alter appreciably the durability of the coatings on any of the seven woods. The durability of paint coatings on southern cypress was not improved by replacing turpentine with benzene in the reduction of the priming coat.

The incorporation of red lead in priming paints hastened the flaking of the coatings from summer wood. A special priming paint containing zinc dust

and zinc oxide decreased the durability of white-lead paint and failed to increase that of lead and zinc paint, although it improved the appearance of both paints. The addition of zinc dust to the standard primer caused effects similar to those of the zinc dust and zinc oxide primer. The addition of a small amount of aluminum powder to primers was practically without effect. Aluminum paint as a primer under top coats of white lead and of lead and zinc paint increased the durability of the coatings markedly.

Special primers for house paints, F. C. SCHMUTZ, F. C. PALMER, and W. W. KITTELBERGER (*Indus. and Engin. Chem.*, *22 (1930), No. 8, pp. 855–860, figs. 7*).—This paper deals with the problem of bonding of paint and wood from the viewpoint of the vehicle used, and shows that varnish in the priming coat affords much better adhesion than vehicles now generally used. This improvement holds regardless of the type of pigment used in combination with the vehicle.

AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY

[Investigations in agricultural economics at the Ohio Station, 1930–31] (*Ohio Sta. Bul. 497 (1932), pp. 151–155*).—Results of investigations not previously noted are reported on as follows:

Variation in the yield of hogs, G. F. Henning and W. B. Stout (pp. 151, 152).—A table is included showing, by months, for 437 carloads of hogs sold in 1930 the number of carloads, weight per hog, time in transit, time until slaughtered, carload shrinkage, and percentage of yield.

Marketing cannery tomatoes in Ohio, C. W. Hauck (pp, 152, 153).—A table is given showing the amounts of pulp stock, waste, and hand-packed and machine-packed tomatoes obtained from experimental lots of U. S. No. 1 and U. S. No. 2 tomatoes canned at a commercial cannery in 1931, the gross sales value of the two grades, and the net differential per ton.

The farm real estate mortgage situation, V. R. Wertz (pp. 153, 154).—A table is given showing for new farm mortgages recorded in Union and Greene Counties in the years 1910, 1920, 1925, and 1930 the number of farms and acreage mortgaged; value of land and buildings mortgaged; amount of mortgage indebtedness recorded, total and per acre; and the ratio of recorded mortgage indebtedness to value of land and buildings.

Costs of local government, H. R. Moore and F. L. Morison (pp. 154, 155).—A table is given showing for each of seven counties for 1930 the average expenditures of townships for different purposes and the amounts withheld from township taxes by counties for township roads, county health districts, and other purposes.

The farm real estate situation, 1930–31, B. R. STAUBER (*U. S. Dept. Agr. Circ. 209 (1931), pp. 68, figs. 6*).—This circular continues the study previously noted (E. S. R., 65, p. 82) and covers for most of the data the year ended March 1 or 15, 1931.

The index of estimated value per acre of farm real estate (1912–1914=100) decreased from 115 in the previous year to 106 in the year studied. The decreases in the different geographic divisions were for New England 1 per cent, Middle Atlantic 5, East North Central 9, West North Central and South Atlantic 12, East South Central 11, West South Central 15, and Pacific and Mountain sections 2 per cent. The number of farms per 1,000 changing ownership through voluntary sales and trades decreased from 23.7 in 1930 to 19 in 1931, that through delinquent taxes increased from 5.1 to 7.4, and that through foreclosures, bankruptcy, etc., increased from 15.7 to 18.7. The number

of farm bankruptcies for the year ended June 30, 1930, was 4,464 as compared with 4,939 for the previous year, and the percentage of all bankruptcy cases was 7.4 as compared with 8.7. The index of taxes on farm real estate for the United States decreased from 106.8 (1924=100) in 1929 to 106.2 in 1930, but there were increases in the New England, Middle Atlantic, West North Central, West South Central, and Pacific divisions. Gross income from farm production in 1930 declined 22 per cent from that in 1929. Operating costs declined less than 9 per cent, wages paid hired labor declined about 18 per cent, and net income declined about 31 per cent. Farm returns as reported by correspondents in 1930 averaged $538, as compared with $1,298 in 1929.

"Outstanding features of the farm real estate situation for the year 1930–31 have been a general and definite writing down of farm land values, a substantial increase in the number of distress sales, a decrease in the number of voluntary transactions, a well-defined tendency for farms in 'strong hands' to be withheld from the market at present prices, and an apparent increase in the demand for farms to rent. Most of the unfavorable developments during the past year may be definitely associated with the drastically reduced agricultural incomes, due in part to the drought, but primarily to the decreasing level of prices and the declining ratio of prices received to prices paid by farmers."

Farm taxation in New Jersey, A. G. WALLER and H. B. WEISS (*New Jersey Stas. Bul. 532 (1931), pp. 29, figs. 2*).—"The purpose of this bulletin is to bring together certain pertinent facts relating to the present farm tax situation in New Jersey and indicate the necessity for considering any changes that may be equitably made." The bulletin is based on data on farm taxes, rates, and assessments gathered regarding 995 farms in 75 townships in 16 counties of the State for the years 1915–1927. The data for 12 counties regarding taxes per acre are also brought down through 1930.

Tables are included and discussed showing for each of the counties, by years, the farm real estate tax per acre and tax index; the highest and lowest township index in 1927; the percentage of the total 1927 assessments made on personal property; the real estate assessments per acre, 1915 and 1927; and the population, by decades 1860–1930 (1910, 1920, and 1930 also by townships). Other tables show the average tax per acre and index, by years 1915–1930, for the State; the acreage, capital invested, net incomes, taxes, and returns on capital on 79 rented farms in 15 counties in 1925, 1926, and 1927; the relation of receipts, expenses, net income, taxes, and investment per farm on certain groups of farms for different years, 1924–1930; the relation of taxes to income on 1,141 farms, 1914–1916; the variations in capital, receipts, expenses, etc., on 36 fruit and vegetable farms, by years 1926–1930; the index numbers, 1910–1930, of farm wages, feedstuffs, and fertilizer prices and prices received by New Jersey farmers; the sources of taxes, 1926 and 1927, for local purposes in certain agricultural townships; and the percentages of total disbursements going for specific purposes.

This study was made in cooperation with the Bureau of Agricultural Economics, U. S. D. A., and the New Jersey State Department of Agriculture. Among the findings are the following:

"The taxes paid by the New Jersey farmers are extremely heavy. Recent studies revealed some astonishing facts. As compared with 1915, the tax per acre in 1930 in Hunterdon, Sussex, Gloucester, Camden, and Burlington Counties increased 220, 256, 220, 567, and 226 per cent, respectively. It means that a farmer who paid, for example, $1 tax per acre in 1915, paid in 1930, $3.20, $3.56, $3.20, $6.67, and $3.26. The situation is intolerable, because the farmers' income, as compared with 1915, does not show any tendency to increase.

"How are the farmers to meet this unjust and oppressive tax burden? All that we know is this: The debt per farm is increasing in New Jersey. The farmers, in order to continue their business, borrow money with the hope that bright days will come when the net profit will be large enough to repay the debts. But bright days never will come unless the legislative body and local authorities of the State accept the simple axiom of the present-day economic structure that the ability to support the government and institutions is measured not by the stock in trade or acreage but by net incomes."

The receipts and expenditures of Virginia counties, R. A. Ballinger (*Virginia Sta. Bul. 282 (1931), pp. 32, figs. 12*).—The receipts and expenditures of Virginia counties, 1923–1928, are analyzed. The amount and sources of receipts; the variations in receipts from different sources; the relation between wealth and total receipts; county taxes and wealth; county expenditures, total and for different purposes; the relation of wealth to expenditures and of size of the expenditures to their distribution; and county debts and their relation to assessed values are discussed.

The annual per capita receipts of about 50 per cent of the counties during the period were between $10 and $16. Nearly 50 per cent of the receipts were used for school purposes and about 25 per cent for roads and bridges. Only about half of the total receipts were secured from county taxes, the remainder coming from the State in the form of aid chiefly for schools. Most counties with relatively high per capita receipts secured a smaller proportion from State aid than did counties with low per capita receipts. Of the county tax levies, about 44 per cent were for school purposes and about 21 per cent each for general county functions and for roads and bridges. About two-thirds of all county taxes were levied on real estate. The annual per capita county taxes during the period ranged from $4 to $11 in about four-fifths of the counties.

Both per capita taxes and per capita total receipts tended to be higher in counties having high per capita assessed values than in those with low per capita assessed values. During the period, total ordinary expenditures increased considerably, but extraordinary expenditures decreased. For nearly 50 per cent of the counties ordinary expenditures were between $10 and $14 per capita. Of the ordinary expenditures, nearly 50 per cent were for schools and over 25 per cent for roads and bridges. Over 50 per cent of the extraordinary expenditures were for roads and bridges and most of the remainder for schools. The proportion of total expenditures used by different counties for schools varied less than the proportions used for other purposes.

Counties with the highest per capita assessed value of taxable property usually had the highest per capita expenditures. Counties with high per capita expenditures usually spent a smaller proportion for schools and a larger proportion for general county purposes than did counties with low per capita expenditures. The debts of most counties were comparatively low, and there was no apparent relationship between the per capita debt and the per capita assessed valuation of property subject to local taxation.

Farm profits and factors influencing farm profits on 176 dairy farms in Hunterdon County, A. G. Waller and E. Rauchenstein (*New Jersey Stas. Bul. 534 (1932), pp. 32, figs. 2*).—This bulletin analyzes the records obtained in the first farm business survey taken in Hunterdon County and covers the calendar year 1930. The survey was made in cooperation with the Bureau of Agricultural Economics, U. S. D. A., and the Hunterdon County Board of Agriculture, and of the records used 116 were obtained in the Flemington area and 60 in the Clinton area. The soils, topography, climate, agricultural changes, and the present farming of the areas are described.

Tables are included and discussed summarizing for each area the data as to capital, receipts, expenses, income, acreage and yields of crops, number and returns from livestock, feeds fed, living furnished by the farm, etc. Analyses are made grouping the farms on the basis of cash receipts, number of productive animal units, and of production sold per cow, and the range of labor income in relation to these groupings is shown. Special analysis is made of the data for six typical successful farms. A comparison is made for each area of the receipts and expenses, by items, as shown by the survey and as estimated for 1931.

Some of the indications of the study follow: With less than $5,000 of total receipts, the farm operator will not be likely to receive much more than the hired man, as measured by labor income. Not more than one-fourth to one-third of total receipts will be left to pay interest on investment and for operator's labor. Only 7 of 143 farms with less than 20 productive animal units had labor incomes of over $2,000, as compared with 14 of the 33 farms having more than 20 productive animal units. Milk represented nearly two-thirds of the total cash receipts, and labor income tended to decrease as production per cow decreased. Farms with silos averaged higher labor incomes, larger production per cow, and less concentrates fed per 100 lbs. of milk produced.

A market analysis of farm sales of milk to dealers in four Ohio cities, R. W. SHERMAN and C. G. MCBRIDE (*Ohio Sta. Bul. 498 (1932), pp. 37, figs. 10*).—This is a study of some of the economic factors affecting market milk which may be dealt with through analysis of producer sales by months. It is based on data regarding farm sales and butterfat tests obtained from the records of dealers and producer marketing associations. Three hundred and three producers in the Cincinnati market and 511 to 802 producers in the Canton market for the years 1925–1929, 708 to 908 producers in the Dayton market for the years 1926–1929, and 400 producers in the Columbus market for the period 1927–1929 are included. The first phase of the study was made to determine the significance of butterfat content as a market factor, and the second phase to ascertain the average daily farm sales by months. Some of the facts brought out in the study follow:

Butterfat content of milk received by dealers is influenced by the base test set for the market, the average content tending to equal, or slightly exceed, the base test after sufficient time has elapsed to permit readjustment of herds. With the exception of Columbus, the test of milk from summer dairies averaged higher than that from winter dairies, but in only one instance the difference amounted to as much as 0.1 per cent for the year's milk supply. The summer dairies varied from 94.6 to 108.6 per cent of the average, and the winter dairies from 96.1 to 105.2 per cent. Sales of small producers averaged higher in butterfat than those of larger producers, the average difference being as high as 0.5 per cent in some markets. Irregular shippers tended to increase the butterfat content of milk sold more than regular shippers.

Length of selling experience in a fluid milk market, degree of intensity of the dairy industry, and the popularity of different breeds of cattle were some of the factors affecting sales per day per dairy in the different sections. Winter dairies had higher average sales per day per dairy and were much less variable in production than summer dairies. Irregular shippers had much lower per day per dairy sales than regular shippers in either the summer or winter dairy groups, but when actually shipping the size of shipments of the irregular shippers was not much lower than that of the regular shippers.

Columbus, the only one of the markets on a basic surplus paying plan, had 16 per cent less seasonal variation in milk receipts than Cincinnati, 21 per cent less than Canton, and 14 per cent less than Dayton. A definite relationship

was found between size of dairies and seasonal variation in receipts within the markets, the small dairies varying most.

In all the markets the summer dairies delivered about one-fourth and the winter dairies about one-third of their year's milk during the last four months of the year. There was no assurance that either summer or winter producers would remain such from one year to the next.

Economics of sheep production in New Mexico (*New Mexico Sta. Rpt. 1931, pp. 11, 12*).—Some findings are given regarding ranch receipts, expenses, and earnings, and efficiency factors on 12 sheep ranches studied over a 3-year period.

[Cost of producing potatoes in Michigan], K. T. WRIGHT (*Michigan Sta. Quart. Bul., 14 (1932), No. 3, pp. 136–140*).—Records for 1930 from 33 growers of table stock and 20 growers of certified seed potatoes are analyzed. Tables are given showing (1) the average costs by items, returns, and the man labor and horse and tractor hours used per acre for each group and for all the farms; (2) the average costs, returns, etc., for the farms in each of the two groups sorted into three groups according to yield; and (3) the costs by items and returns from the farms growing certified potatoes sorted into groups on the basis of expenditures for green manure, barnyard manure, commercial fertilizer, seed, seed treatment, spraying, and man labor, of date of planting, and whether the fields were spring or fall plowed.

The agricultural outlook for the Southern States, 1931–32 (*U. S. Dept. Agr., Misc. Pub. 137 (1931), pp. 56*).—This report was prepared by the staff of the Bureau of Agricultural Economics in cooperation with representatives of the State agricultural colleges and extension services of the Southern States, the Extension Service of this Department, and the Federal Farm Board, and was adopted by the Southern Outlook Conference, held at Memphis, Tenn., November 10–13, 1931. The outlooks for domestic and foreign demand for farm products, for farm credit, and for individual farm products are discussed.

Some facts about the cotton outlook for 1932 (*U. S. Dept. Agr., Misc. Pub. 139 (1932), pp. 8, figs. 6*).—Charts covering different periods from 1890 to the 1931–32 season are included and discussed showing the changes in cotton prices compared with the prices of goods farmers buy; cotton production, carry-over, and consumption; world consumption of cotton of America, Egypt, India, and other countries; the acreage and yield per acre of cotton in the United States; and the production of cotton in the United States and foreign countries. Some suggestions are made for southern farm adjustments in 1932.

Protein tests for wheat and oil tests for flaxseed and soybeans: Importance in production and marketing (*U. S. Dept. Agr., Misc. Pub. 140 (1932), pp. 45, figs. 5*).—This report, prepared by the Bureau of Agricultural Economics, presents the views of the bureau regarding the various proposals that have been under discussion in the grain industry, in the State agricultural colleges, and in the Congress for the improvement of grain-marketing practices by means of the organization of national protein and oil-testing services and premarketing and current estimating services covering the supply of protein in wheat and of oil in flax.

The annual average protein content and the average monthly protein premiums paid during different crop years for No. 1 dark northern spring wheat at Minneapolis and for No. 2 hard winter wheat at Kansas City; the relation between supply of high-protein wheat and protein premiums; premiums for low-protein soft red winter and white wheats; the necessity for adequate estimates of the average protein content of each wheat crop and the inadequacy of the present estimates; the reflection of protein premiums to producers and country

shippers; the uses of the protein test in wheat marketing; the impracticability of using protein content as a grade factor; the protein-testing services established by State and commercial laboratories; the needs for standardization of sampling, testing, and certification; and some of the means by which marketing wheat by protein content can be facilitated and improved are described and discussed.

The oil content of flaxseed and soybeans, the oil content of flaxseed as a measure of processing value, existing marketing practices for flaxseed, and oil-testing service and surveys in relation to market practices for flaxseed and soybeans are also described and discussed.

Future trading and the cash-grain markets, G. W. HOFFMAN (*U. S. Dept. Agr. Circ. 201* (*1932*), *pp. 56, figs. 6*).—The essential features of the cash-grain markets and the markets for futures are summarized and contrasted, cash and futures prices are compared, and the hedging and market-making functions of future trading are described and discussed.

Spot prices, wheat and corn, 1879—52 years—1930 (*U. S. Dept. Agr., Grain Futures Admin.*, *1931*, *pp.* [*18*], *pl. 1*).—A table and chart show the monthly high and low spot prices of contract wheat and corn at Chicago from January, 1879, to December, 1930, inclusive. Explanatory notes covering some of the more important peak prices are included.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Workers in subjects pertaining to agriculture in State agricultural colleges and experiment stations, 1931–1932, M. A. AGNEW (*U. S. Dept. Agr., Misc. Pub. 134* (*1932*), *pp. IV+131*).—This is the usual annual list (E. S. R., 65, p. 190) of workers in agriculture and home economics.

FOODS—HUMAN NUTRITION

[**Nutrition studies of the Wyoming Station**] (*Wyoming Sta. Rpt. 1931*, *pp. 32–35*).—Results are noted from progress reports of comparative studies by E. J. Thiessen of the cooking qualities and vitamin C content of dry land v. irrigated potatoes, freshly dug and after storage in a moist potato cellar for varying lengths of time, and from a continuation of the study of the effect of storage on the baking quality of Wyoming flour (E. S. R., 65, p. 191).

The iron content of vegetables and fruits, H. K. STIEBELING (*U. S. Dept. Agr. Circ. 205* (*1932*), *pp. 20*).—This circular presents the results of the author's analyses for iron of 237 specimens of 82 different forms, parts, or varieties of vegetables and fruits, together with such data from the literature as were considered reliable. In the author's analyses dry ashing was followed with determinations of the iron in hydrochloric solutions of the ash by the Zimmermann-Reinhardt method, essentially as described by Fales (E. S. R., 55, p. 205). All of the figures reported are in terms of the percentage of iron in the edible portion of fresh products of normal appearance.

Of the 110 average analyses, 12 represent dried or mature and 98 fresh, succulent, or immature plant products. In the discussion of results, the larger group of fresh or succulent products is further divided into four groups on the basis of iron content. Products containing less than 0.0004 per cent of iron are classified as poor, from 0.0004 to 0.00079 per cent as fair, from 0.0008 to 0.00159 as good, and 0.0016 per cent or more as excellent sources of iron. The specific foods listed in the group of excellent sources are Lima beans, beet tops, broccoli leaves, celeriac leaves, chard, chives, collards, cowpeas, dandelion greens, kale, mustard greens, parsley, peas (English, garden), spinach,

turnip tops, salsify, and *water cress.* Attention is called to the association between iron and chlorophyll in plant tissues and to the special importance of green-colored vegetables in the diet.

A study of the losses incurred in cooking and the factors affecting the palatability of the New Mexico pinto, bayo, and other varieties of beans (*New Mexico Sta. Rpt. 1931, pp. 43, 44*).—In this progress report (E. S. R., 65, p. 288) proximate analyses are given of several samples of pinto, Great Northern, and bayo beans from both irrigated and nonirrigated sections and from localities of varying altitudes throughout the State.

The energy and the protein content of edible food waste and mixed meals in sorority and fraternity houses, F. G. Benedict and A. G. Farr (*New Hampshire Sta. Bul. 261 (1931), pp. 35, figs. 2*).—The chief purpose of this investigation was to determine whether or not the energy content of edible food wasted at meals can be calculated with reasonable accuracy by multiplying the air-dry weight of a mixture of the waste by a constant factor, as was found possible with a composite aliquot sample of food consumed (E. S. R., 61, p. 890). To this end samples of edible waste were collected from one fraternity house and two sorority houses and analyzed for energy and protein content. In addition, samples of mixed meals from the sorority houses and of a number of so-called extra foods were also analyzed. The food consumption in the fraternity house was calculated from an inventory of the food supplies purchased and used during the time of the study. The general technic followed was the same as in the previous study, the combustions being made in the oxy-calorimeter. Certain modifications in this apparatus for the better control of temperature during combustion are described and the general principles of its operation discussed.

At the fraternity house samples of edible waste from breakfasts, dinners, and suppers were collected for 1 week. At one of the sorority houses samples from lunches and dinners were collected for 2 weeks, and at the other sorority house for nearly a month. At the second sorority house a study was also made of the waste of individual students and of the energy and protein value of extra foods consumed. In terms of the total foods served in the three houses, the waste represented 11, 3, and 12 per cent of the total food energy and 10, 4, and 21 per cent of the protein, respectively. The seemingly large waste of well-prepared and well-served food, particularly in the second of the two sorority houses, is explained by the consumption away from the table of extra foods which, in the case of the four students for whom this was calculated, corresponded to from 13 to 29 per cent of the total energy intake per day. The 104 samples of mixed meals collected at the two sorority houses had an average energy value of 4.7 calories per gram of air-dry weight, the exact figure reported in the previous study. The average energy value of 63 samples of edible waste collected at the three houses in the present study was 5 calories per gram of air-dry matter. Individual samples of waste varied in energy value with the fat content, values as high as 9.3 calories per gram of air-dry weight being obtained in samples with considerable visible fat.

On the basis of these results, "it is recommended that the energy content of edible table waste (as distinguished from kitchen refuse) can be calculated with reasonable accuracy by multiplying the air-dry weight in grams by the factor 5, if visible fat is not present. If there is visible fat and it can be removed easily, its energy value should be calculated separately by multiplying its weight in grams by the factor 9, and the rest of the waste should then be considered to have an energy content of 5 calories per gram of air-dry matter."

Basal metabolism of women over thirty-five years of age, H. McKay (*Ohio Sta. Bul. 497 (1932), pp. 145, 146*).—Average basal metabolism data are given for 50 women from 35 to 70 years of age as compared with previously reported values for young women from 14 to 18 years of age (E. S. R., 64, p. 492).

Further studies on the metabolism of Eskimos, P. Heinbecker (*Jour. Biol. Chem., 93 (1931), No. 2, pp. 327–336*).—A further investigation of the metabolism of normal Eskimo subjects after periods of fasting (E. S. R., 61, p. 87) is reported. The present study was conducted at Pangnirtung, Baffin Island, latitude 66°, on four subjects who were in the employ of the Hudson's Bay Company and the Royal Canadian Mounted Police, and in consequence were living on a more mixed diet than the customary native diet.

With each of the subjects ketosis appeared and increased with the duration of the fast, but, with the exception of a woman who was under the double drain of lactation and pregnancy, the amounts of acetone bodies excreted were very small. The respiratory quotients were likewise low. These findings are thought to confirm the tentative conclusion of the earlier study that Eskimos are able to oxidize fats more completely than ordinary persons.

The basal metabolism values were not as high as in the previous study and checked well with the Du Bois standards. The higher figures of the earlier study are attributed to the higher protein metabolism on the meat diet in comparison with the mixed diet of the present study.

Clinical calorimetry—XLVII, Prolonged meat diets with a study of the respiratory metabolism, W. S. McClellan, H. J. Spencer, and E. A. Falk (*Jour. Biol. Chem., 93 (1931), No. 2, pp. 419–434, figs. 4*).—Respiratory metabolism studies in the basal condition and after food were conducted by the author, with the technical assistance of G. F. Soderstrom, on the subjects of the elaborate investigation of the effects of prolonged meat diets (E. S. R., 64, p. 289). The data showed no significant elevation in the basal metabolism as a result of prolonged subsistence on an exclusive meat diet. The excretion of nitrogen in the urine varied from 0.5 to 0.8 g per hour when the subjects were in a basal condition, and rose to considerably higher values, in one case 2.12 g per hour, after eating the lean meat. The extra heat induced by lean meat in amounts of 300 to 500 g ranged from 14.6 to 45.3 per cent of the basal heat production in this instance. It was calculated that the subject was deriving 63 per cent of his energy from protein.

The rôle of copper in hemoglobin regeneration and in reproduction, H. L. Keil and V. E. Nelson (*Jour. Biol. Chem., 93 (1931), No. 1, pp. 49–57, figs. 2*).—A repetition of the authors' earlier experiments (E. S. R., 64, p. 581), with greater care in technic to avoid coprophagy by the rats and contamination of the milk with copper, has led to the conclusion that pure iron in the form of ferric chloride is incapable of regenerating hemoglobin in rats on a milk diet. Salts of vanadium, titanium, manganese, nickel, arsenic, germanium, zinc, chromium, cobalt, tin, and mercury proved incapable of supplementing the iron, but copper was effective.

Observations upon the rôle of copper in reproduction are also reported. Several female rats receiving milk supplemented with iron and copper and mated to males on the same diet reproduced, but an attempt to raise four of the litters was successful in only one case, the other three litters being consumed by the mothers.

A change in color of the fur of rats suffering from nutritional anemia is noted. Black fur changed to a silvery gray and gray fur to a buff or yellowish gray. No change took place when the milk diet was supplemented with iron alone, but when copper was administered in addition the original color of the fur was restored in about two months.

Vitamins in canned foods.—X, The vitamin content of some common vegetables, E. F. Kohman, W. H. Eddy, and C. Z. Gurin (*Indus. and Engin. Chem., 23 (1931), No. 7, pp. 808–811, figs. 3*).—Continuing the series of studies noted previously (E. S. R., 65, p. 293), the authors have compared commercially canned turnip greens with raw celery (bleached or green), raw head lettuce (inner and outer leaves), and raw carrots (whole and shredded, the latter after standing for 1 and 3 hours, respectively) for their content of vitamins C, A, and the B complex.

The quantities stated to give complete protection to guinea pigs against scurvy were 6 g daily of the turnip greens, 10 g of bleached or green celery, 15 g of whole raw carrots, and 25 g of shredded raw carrots kept for 3 hours after shredding.

In the vitamin A experiments with rats 15 mg of the canned turnip greens per day proved insufficient and 25 mg adequate "to avoid any evidence of vitamin A deficiency and to permit good growth." The latter amount was estimated to supply more vitamin A than 5 g of bleached celery and as much as 500 mg of unbleached celery.

Celery, bleached and unbleached, and canned turnip greens were lower than the inner leaves of head lettuce in their content of the vitamin B complex, amounts up to 5 g daily proving inadequate. When the canned turnip greens were supplemented with the Jansen-Donath antineuritic vitamin concentrate, 3 g of the greens sufficed to prevent vitamin B_2 deficiency and 5 g promoted good growth.

Infant deaths and vitamin starvation (*Lancet [London], 1931, II, No. 8, p. 413*).—This is a brief summary of conclusions reached in the report circulated among the members of the North Kensington Medical Society (England) of an analysis of the cause of 180 deaths of infants under 1 year of age occurring in that borough during 1928. Of particular significance are the observations that the children between 6 months and a year of age who died from bronchitis and broncho-pneumonia were from very well-to-do as well as poor families, that a large proportion of them had shown signs of rickets, and that of 55 infants who died from respiratory infections, 30 had been completely and 18 partially breast fed. It is considered that a deficiency in vitamin A would be sufficient to account for the occurrence of broncho-pneumonia with rickets in children between 6 and 12 months of age, and that in the very young breast-fed babies the condition may be traced to faulty diet and environment of the mothers during pregnancy. The suggestion is made in the report that in many cases a good brand of dried milk might be better for infants than breast milk of the quality they may be receiving.

Studies on the vitamin-B complex, C. H. Hunt, R. M. Bethke, and W. Wilder (*Ohio Sta. Bul. 497 (1932), p. 144*).—This progress report (E. S. R., 64, p. 694) discusses the relative values of different adsorbing agents for vitamin B.

The vitamin B and G content of New Mexico pinto beans, the effect of different methods of cooking, and the effect of aging upon the content of these vitamins (*New Mexico Sta. Rpt. 1931, pp. 44, 45, figs. 2*).—In this preliminary report it is noted that the raw pinto bean is a very good source of vitamin B (B_1).

A study of the vitamin C content of carrots preserved by canning and cold storage (*South Dakota Sta. Rpt. 1931, pp. 23, 24*).—Data are given on the relative vitamin C potency of raw, cooked, and home canned carrots.

Vitamine D in bone tuberculosis in children, H. G. Grayzel, M. J. Shear, and B. Kramer (*Amer. Rev. Tuberc., 24 (1931), No. 2, pp. 106–112*).—The study reported was conducted on 18 tuberculous children from 3.5 to 12 years of

age, 17 of whom had bone tuberculosis and the other tuberculosis of the skin. All of the children received a diet rich in vitamins and supplemented with 2 tablespoonfuls daily of a preparation of maltine with cod-liver oil. Half of the group were given a standard irradiated ergosterol containing 2,000 rat units (U. S.) per milligram in amounts of 4 mg daily for the first 4 months and 7 mg daily for the succeeding 8 months. The blood serum calcium and phosphorus were determined at the end of 6 and 12 months.

A comparison of the group receiving the irradiated ergosterol with those receiving only the maltine with cod-liver oil showed no acceleration of healing processes in the former group. No toxic symptoms were noted, however, nor was there any observable pathological calcification or abnormal increase in the concentration of serum calcium or of serum phosphorus.

The results in this small series of patients tend to confirm the conclusions of Pattison, based on a larger series, that the administration of large amounts of vitamins A and D is of no greater value in the treatment of bone tuberculosis than cod-liver oil alone.

The antirachitic value of irradiated yeast, S. K. Kon (*Lancet [London], 1931, II, No. 11, pp. 579–582, figs. 7*).—Irradiated yeast, prepared in the same manner as that used in the feeding experiments with rachitic children noted previously (E. S. R., 63, p. 495), was tested for its content of vitamin D by rat feeding experiments. The results were in close agreement with those reported by Steenbock et al. (E. S. R., 64, p. 793), 1 mg containing 1 unit of the vitamin. The preparation was very stable, retaining its potency for at least 10 months at room temperature. Prolonged administration of the irradiated yeast in amounts constituting 10 per cent of the diet was followed by cessation of growth and gradual decline in the first generation and failure of reproduction in the second. The same amount of nonirradiated yeast was without harmful effects. It is thought, however, that irradiated yeast is no more toxic for rats, unit for unit, than is irradiated ergosterol.

The incidence of osteomalacia and late rickets in northern India, D. C. Wilson (*Lancet [London], 1931, II, No. 1, pp. 10–12*).—A brief summary of the investigation noted previously (E. S. R., 65, p. 398).

The effect of large doses of irradiated ergosterol upon nitrogen, calcium, and phosphorus metabolism in rats, R. Kern, M. F. Montgomery, and E. U. Still (*Jour. Biol. Chem., 93 (1931), No. 2, pp. 365–380*).—In this contribution to the extensive literature on the general question of the effects of large doses of irradiated ergosterol on normal animals, evidence obtained with the technical assistance of J. Boersma and V. Hunkle is reported essentially as follows:

In growing rats large daily doses of irradiated ergosterol resulted in the accumulation of considerable calcium in the kidneys, with much larger deposits in the females than in the males. Small deposits were found in the heart and aorta but no abnormalities in the thigh muscles and no changes in the calcium content of the bones as far as could be determined by chemical analysis.

The excretion of calcium in the feces was decreased, and that in the urine was greatly increased. This was also true to a less extent for phosphorus. The nitrogen excretion in the urine was within a normal range and was affected mainly by the level of food intake. The importance was emphasized of maintaining satisfactory food intake in studies of this type.

It was concluded that erogsterol irradiated in alcohol produced greater disturbances in the calcium metabolism of growing rats than either ergosterol irradiated in ether or irradiated dry.

Sources of radiation and their physical characteristics: Cold red ray and cold ultraviolet ray lamps, W. W. Coblentz (*Jour. Amer. Med. Assoc., 97 (1931), No. 26, pp. 1965–1967*).—This paper supplements earlier communications describing the physical characteristics of sources of ultra-violet and infra-red radiation (E. S. R., 62, p. 592). The cold red ray lamp described is a neon glow lamp with maximum radiation in the region of 650 mμ and with very little, if any, stimulating effect upon the human body. The so-called cold quartz mercury vapor lamp has a low vapor pressure, a low amperage (0.015 ampere), and a high potential. A lamp of this type is the new ultra-violet glow lamp G-1.

Radiation measurements on two types of cold quartz ultra-violet generators showed that 97.8 and 94 per cent, respectively, of the total wave lengths less than and including 313 mμ transmitted were of 254 mμ wave length. Attention is called to the fact that ultra-violet rays of this wave length, although producing conjunctivitis readily, do not penetrate deeply into the skin and produce only a superficial erythema even on overexposure, while wave lengths of 310 to 315 mμ, which are very intense in sunlight, produce painful blisters when the body is exposed for only a short time beyond that of the minimal erythema dose. The importance is emphasized of timing the sun bath properly in order to avoid severe burns.

The cure of infantile rickets with tungsten-filament radiation, H. J. Gerstenberger and A. J. Horesh (*Jour. Amer. Med. Assoc., 97 (1931), No. 11, pp. 766–770, figs. 19*).—This paper reports the cure of moderately severe rickets in three infants, two negro and one white, by daily 12-hour exposures to suberythemal doses of tungsten-filament radiation from a 500-w CX Mazda "dual-purpose" lamp. These results are thought to indicate that dual-purpose lighting as proposed by Luckiesh (E. S. R., 65, p. 105) probably will become practically feasible.

The anemias of infancy and early childhood: Some observations, L. G. Parsons (*Jour. Amer. Med. Assoc., 97 (1931), No. 14, pp. 973–979, figs. 3*).—In this lecture the nutritional anemias of infancy and early childhood are classified as simple or dietetic and endogenous or constitutional. In the author's clinical experience all cases of the first type have been cured by iron therapy and a varied diet, but as the iron salt used always contained traces of copper the theory that copper is essential as a supplement to iron is thought not to be disproved. The term constitutional nutritional anemia is applied to the particular group of anemias which do not respond to dietary treatment. This type occurs in newborn or very young infants, particularly in premature infants and twins. While it does not yield to the dietary treatment of simple nutritional anemia, improvement eventually occurs, with recovery at about 2 or 3 years of age, if the subjects have not succumbed to intercurrent diseases or even to the anemia itself. A similar anemia has been produced in the second generation of rats on a milk diet supplemented with yeast.

It is suggested that this type of anemia may be due to a temporary error of metabolism. "There is some evidence of an inborn error or lack of some substance or substances which the infant can not synthesize from his food afforded by our yeast rat experiments and also by the facts that so many of the patients are either premature or twin babies, or both. Whatever the cause may be, the reticulo-endothelial system is affected, resulting in a defect of hemoglobin synthesis with or without a diminished number of red cells."

An improved technique for the production of nutritional anemia in rats, C. A. Elvehjem and A. R. Kemmerer (*Jour. Biol. Chem., 93 (1931), No. 1, pp. 189–195*).—The improved technic described consists in preventing the consump-

tion of food other than milk by the young during the nursing period. This is accomplished by furnishing the mother rat no food but milk in the cage where the young are born and kept. Each day the mother is removed to a separate cage for feeding the dry ration and is thoroughly brushed to remove any food particles adhering to the fur before being returned to the young. Under these conditions the young rats develop a severe anemia, usually within 2 weeks after weaning at 21 days of age. Individual records of rats from three different litters showed a range of from 8 days to 3 weeks in the onset of severe anemia. It is considered important to reduce the number in the litter to 6 on account of the limited supply of dry food consumed by the mother.

Figures are also presented showing that rats rendered anemic by this method are suitable for iron and copper metabolism studies, and that the technic may also be used in manganese metabolism studies.

Ineffectiveness of purified glutamic acid as a supplement to iron in the correction of nutritional anemia, C. A. Elvehjem, H. Steenbock, and E. B. Hart (*Jour. Biol. Chem., 93 (1931), No. 1, pp. 197–201, fig. 1*).—The authors, with the cooperation of E. Van Donk, have repeated under carefully controlled conditions the experiments of Drabkin and Miller (E. S. R., 65, p. 597) leading to the conclusion that glutamic acid when added to a milk diet supplemented with iron is capable of curing anemia.

Typical results are reported, showing that relatively large amounts of pure glutamic acid were incapable of correcting the anemia. Suggesions in line with the criticism of an earlier paper of Drabkin and Waggoner (E. S. R., 65, p. 893) are given in possible explanation of the positive results obtained by these authors.

The value of the oyster in nutritional anemia, H. Levine, R. E. Remington, and F. B. Culp (*Jour. Nutrition, 4 (1931), No. 4, pp. 469–481, fig. 1*).—The material tested, consisting of a mixture of three dried oyster samples containing 892 parts of iron, 58 of copper, and 20 of manganese per million, was fed daily at various levels to young rats whose hemoglobin content had fallen to an average level of 5.68 g per 100 cc on reconstituted dried milk. Hemoglobin regeneration to a normal level was brought about in from 2 to 3 weeks when the material was fed at a level of 0.56 g daily and in from 4 to 5 weeks when fed at a level of 0.28 g daily, and there was 80 per cent blood regeneration in 8 weeks when the material was fed at a level of 0.14 g, representing 1 g of fresh material. A comparison of dried oysters, an acid solution of oyster ash, and a solution containing iron, copper, and manganese in the same proportions as in oyster ash showed that all three supplements promoted blood regeneration at approximately the same rate. This is thought to indicate that no elements other than iron, copper, and manganese are required for hemoglobin regeneration. The question as to the necessity for manganese could not be answered from the results of this study.

On the basis of Sherman's estimate of the iron requirements of man as being about 15 mg per day and the average content of iron in the oyster, it is considered that 120 g, or 4.2 oz., of the undried oyster would furnish this daily requirement.

Oysters: A pleasant type of therapy (*Jour. Amer. Med. Assoc., 97 (1931), No. 26, pp. 1970, 1971*).—In this editorial comment on the paper of Levine, Remington, and Culp noted above, attention is called to the fact that copper and iron are more common in foods than might be anticipated. It is thought that the demonstration that oysters are capable of curing the nutritional anemia of milk-fed rats will probably be followed by other comparable discoveries, "making the administration of copper a gustatory delight rather than the mere ingestion of 'a dose of medicine.'"

Simple achlorhydric anaemia, D. T. DAVIES (*Lancet [London], 1931, II, No. 8, pp. 385-391*).—The author discusses, with numerous references to the literature and his own clinical observations, the cause, symptoms, and treatment of simple achlorhydric anemia, this term being used to indicate chronic and simple anemia accompanied by achlorhydria frequently occurring in middle-aged women. The condition is considered to be the result of a combined iron deficiency consequent on a defective diet and impaired gastric secretion. The administration of iron corrects the disorder but does not remove the cause, which requires attention to the gastric secretion and measures to improve it. The history of patients suffering from this type of anemia is long-continued abstinence from meat and generally from green vegetables on account of digestive disturbances and the consequent subsistence on concentrated starchy foods low in iron.

Hemoglobin production.—III, The relief of anemia, due to milk diet, by feeding amino acids and related compounds, D. L. DRABKIN and H. K. MILLER (*Jour. Biol. Chem., 93 (1931), No. 1, pp. 39-48, figs. 3*).—In this continuation of the series of papers noted previously (E. S. R., 65, p. 597), data are reported which are thought to indicate that "while succinic acid and succinimide are somewhat effective in the relief of milk anemia, leucine, cystine, glycine, α-amino valeric acid, and glutaric acid are ineffective. Rats have been found to become anemic as readily upon boiled as upon raw milk. The onset of anemia has been retarded by the administration of an iron salt at a low level which was ineffective in curing the anemia once produced. Rats receiving milk supplemented with sodium glutamate appeared definitely more resistant to anemia, even in the absence of iron administration, than rats which were fed iron alone or iron and alanine."

The lack of correlation between anemia and the pellagra-like symptoms in rats, N. HALLIDAY (*Science, 74 (1931), No. 1917, pp. 312, 313*).—This contribution from the Michigan Experiment Station was occasioned by the brief paper of Bliss (E. S. R., 64, p. 595) in which the theory was advanced that pellagra in human beings and blacktongue in dogs are caused by a deficiency in iron. Experiments are reported briefly demonstrating that the pellagra-like symptoms in rats brought about by a deficiency in vitamin G (B_2) are not prevented or cured by iron. The basal vitamin G-deficient diet on which dermatitis developed, in most cases in from 3 to 4 weeks, contained ferric citrate in amounts furnishing 0.29 mg of iron for each gram of diet. Since the rats even after the development of dermatitis rarely consumed less than 1.5 to 2 g of food daily, it was assumed that the iron intake was sufficient. As a further precaution 6 animals, 3 of which had been on the basal diet for 10 weeks and 3 for only a short time, were given 0.5 mg of iron and 0.1 mg of copper daily for 6 days a week. No improvement took place in the first group, and dermatitis developed in the usual time in the other. In no case was there any gain in weight such as might be expected if the rats had been anemic.

The author concludes that if human pellagra and blacktongue of dogs are proved to be iron-deficiency diseases, the pellagra-like symptoms in rats resulting from vitamin G deficiency must be due to some other cause.

The iron-deficiency hypothesis in pellagra, S. BLISS (*Science, 75 (1932), No. 1940, p. 266*).—A reply to the article of Halliday noted above.

A system of weighed high carbohydrate diets for diabetes, J. J. SHORT (*Jour. Amer. Med. Assoc., 96 (1931), No. 23, pp. 1940, 1941*).—Five diabetic diets relatively high in the ratio of carbohydrate to fat are presented, together with a reducing diet of 1,000 calories.

The diabetic diets contain protein in multiples of 15 g from 30 to 90 g daily, fat approximately 1½ times the protein, and carbohydrate twice the fat. The caloric values range from 910 to 2,831 calories. In the reducing diet the fat is low (30 g daily), the protein (60 g) is considered to be adequate for maintaining nitrogen equilibrium in the average individual, and the diet as a whole is highly antiketogenic.

The rôle of artichokes in the diet of the diabetic patient, H. B. STEIN, B. B. LONGWELL, and R. C. LEWIS (*Arch. Int. Med., 48 (1931), No. 2, pp. 313-324*).—This study was undertaken on account of the controversial nature of literature reports concerning the utilization of the carbohydrates of the Jerusalem-artichoke by the diabetic patient, as noted by Westcott and Wise (E. S. R., 62, p. 791).

Jerusalem-artichokes were included in the diets of a group of patients after a fairly constant level of sugar excretion was obtained, "(1) by substitution for other carbohydrates to determine whether or not the carbohydrates of the artichoke would be better metabolized in the diabetic organism, and (2) by addition to the diet as a further means of testing whether or not the artichoke contained some principle, similar to the glucokinin of Collip, which would stimulate better combustion of the carbohydrate fed."

Three case reports are given to illustrate the general results obtained, leading to the conclusion that the carbohydrates of the Jerusalem-artichoke are absorbed and utilized by patients with mild or moderate diabetes, but to no better extent than carbohydrates from other sources. In cases where a decrease in the amount of sugar eliminated was noted there also occurred large amounts of intestinal gas arising from bacterial fermentation. This is thought to account for a reduction in the amount of assimilable carbohydrate sufficient to cause the decrease in sugar eliminated.

It is thought, however, that the practice of using Jerusalem-artichokes as a part of the diabetic diet is worth while on account of the additional variety which it offers.

Mottled enamel (*Jour. Amer. Med. Assoc., 97 (1931), No. 19, pp. 1389, 1390*).—This editorial summarizes briefly recent contributions to the subject, particularly the report of Smith, Lantz, and Smith (E. S. R., 65, p. 596) in which the cause of mottled enamel is traced convincingly to excess fluorine in the drinking water.

TEXTILES AND CLOTHING

[Textile research in Ohio] (*Ohio Sta. Bul. 497 (1932), pp. 148, 149*).—Continued textile studies (E. S. R., 64, p. 606), by M. Griffith dealt with the influence of laundering and exposure to light upon some washable silks and the influence of position isomerism in azo dyes upon fastness to light and washing.

Present condition of industrial microbiological retting of textile plants, G. STAMPA (*[Internatl. Rev. Agr.], Mo. Bul. Agr. Sci. and Pract. [Rome], 22 (1931), No. 2, pp. 63-74, fig. 1*).—This review embraces 35 references.

Fibres of Asclepias spp. (*Bul. Imp. Inst. [London], 29 (1931), No. 4, pp. 441-458*).—The characteristics and textile values of the floss and bast fibers of milkweeds, including *A. curassavica*, *A. fruticosa*, *A. glaucophylla*, *A. incarnata*, *A. physocarpus*, *A. semilunata*, *A. syriaca*, and *A. tuberosa*, are described from studies by various agencies.

Wool quality, S. G. BARKER (*London: [Gt. Brit.] Empire Marketing Bd., 1931, pp. 328, pls. 41, figs. 39*).—This comprehensive study of the influence, significance, and measurement of factors contributing to quality in wool, treats

of wool classing and sorting, yolk, grease or fat, methods of measuring interrelationships of wool fiber characters, the chemical composition and structure of wool, kemp, and defects of the fleece lowering quality. The bibliography embraces more than 600 titles.

The influence of various grades of wool on some of the physical properties of flannel (*South Dakota Sta. Rpt. 1931, pp. 22, 23*).—Tentative conclusions are drawn from the research.

MISCELLANEOUS

Agricultural investigations at the United States Field Station, Sacaton, Ariz., 1925–1930, C. J. King and H. F. Loomis (*U. S. Dept. Agr. Circ. 206 (1932), pp. 64, figs. 20*).—The experimental work reported is for the most part abstracted elsewhere in this issue.

Report of the South Mississippi Branch Experiment Station for 1931, J. C. Robert, W. S. Anderson, and W. W. Welborne (*Mississippi Sta. Bul. 297 (1931), pp. 18*).—The experimental work reported is for the most part noted elsewhere in this issue.

Forty-second Annual Report [of New Mexico Station, 1931], F. Garcia (*New Mexico Sta. Rpt. 1931, pp. 76, figs. 7*).—The experimental work reported is for the most part noted elsewhere in this issue.

Fiftieth Annual Report of [Ohio Station], 1931, C. G. Williams et al. (*Ohio Sta. Bul. 497 (1932), pp. 201, figs. 42*).—The experimental work reported not previously referred to is for the most part noted elsewhere in this issue.

[Annual reports of county experiment farms, 1930] (*[Ohio Sta., Co. Expt. Farms Rpts.] 1930, pp. [37]*).—The experimental work reported is for the most part noted elsewhere in this issue.

Annual Report of [South Dakota Station, 1931], J. W. Wilson (*South Dakota Sta. Rpt. 1931, pp. [2]+45*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Forty-first Annual Report of [Wyoming Station, 1931], J. A. Hill (*Wyoming Sta. Rpt. 1931, pp. 62*).—In addition to meteorological observations noted on page 12, the experimental work not previously referred to is for the most part abstracted elsewhere in this issue.

NOTES

California University.—A gift by W. K. Kellogg of Battle Creek, Mich., of his ranch of 750 acres near Pomona, together with a stud of 87 Arabian horses thereon and an endowment of $600,000, has been accepted by the university under an agreement to establish the W. K. Kellogg Institute of Animal Husbandry. This institute, which is to be organized and administered by the university as a part of its division of animal husbandry, will have as its primary function for a period of at least 40 years the breeding and improvement of the Arab horse. Genetic and breeding investigations with other animals, as well as research in other fields of animal science, may be undertaken by the institute if and when sufficient income is available.

Georgia Station.—Effective January 1, 1932, the station was placed by the legislature under the control of the board of regents charged with the management of all branches of the university system of the State.

A new cattle barn of fireproof construction is being built at a cost of about $2,200.

Idaho University and Station.—A section of the university dairy barn was burned April 21. About half of the building was saved, together with all records and the entire dairy herd. The property was covered by insurance and it is hoped to rebuild by fall.

Purdue University and Station.—E. H. Parfitt, assistant professor and associate in dairy bacteriology, has been granted a year's leave of absence for graduate work at the Iowa College.

Maryland University.—In a case regarded as of considerable importance to the staffs of State universities and similar institutions, the United States Board of Tax Appeals ruled on May 3 that G. Ridgely Sappington, part-time instructor in the college of law of the university, was exempt from payment of Federal income tax on salary received for teaching in the university. According to a press report, "the board held that Mr. Sappington was an employee of the State, engaged in an essential function of State government, and, consequently, under the constitutional provision barring Congress from taxing the States, their agencies, or employees, his compensation from the university was not taxable. . . . The ruling in the Sappington case will free all faculty members in all colleges of the University of Maryland from paying Federal income tax on their institutional salaries. Until now the board has held that the university was an eleemosynary institution and not an integral agency of the State. The decision affects faculty members in other State universities and colleges also."

Minnesota University and Station.—The Federal forest research work in the Lake States region, carried on by the Lake States Forest Experiment Station in cooperation with the university, has been expanded by the establishment of three field laboratories, with a total of approximately 5,400 acres and located within the Chippewa and Superior National Forests. One of these laboratories is to be known as the Cutfoot Experimental Forest, located about 24 miles from Deer River and well stocked with thrifty growing timber, mainly Norway and jack pine. The second is the Pike Bay Experimental Forest, located

approximately 6 miles from Cass Lake, and is predominantly an aspen hardwood type. The third is the Kawishiwi Experimental Forest of 2,635 acres, about 13 miles from Ely, and representing a distinctive region, including the jack pine, black spruce, and aspen types.

The Thomas Burr Osborne medal for distinguished contributions in cereal chemistry has been awarded by the American Association of Cereal Chemists to Dr. C. H. Bailey, professor of agricultural biochemistry in the university and cereal chemist in the station. This is the second award of this medal, the first having been given to Dr. Osborne in 1927 for his classic studies in plant proteins.

Mississippi College.—The legislature has adopted a measure providing a single board of 11 trustees, with an additional member for the State university. The governor is to be an ex officio member of the board, which is to be known as the board of trustees of institutions for higher learning, and with the consent of the senate is to appoint the remaining members for 4-year, 8-year, and 12-year terms. Subsequent appointments are to be for 12-year regular and 10-year vacancy terms.

New York State Station.—According to a recent announcement from the station, experiments begun last year on the preservation of fruits and vegetables by quick freezing are to be continued and greatly expanded during the coming season. It has been found that different varieties behave quite differently when preserved by this process, and one of the chief objects will be to determine which sorts are best suited. The project is part of the station research program designed to develop new outlets for the farm products of the State, and is in cooperation with a commercial frosted foods laboratory in Massachusetts which is furnishing the freezing cabinets and trained workers to prepare the samples and operate the freezers. Information will be sought on how the freezing affects the tissues from both the chemical and bacteriological standpoints.

Pennsylvania College and Station.—The new dairy building has been completed and will be formally dedicated August 26. It consists of two parts, connected by a 30-ft. corridor. The front section, 174 by 58 ft., is to be used mainly for offices, laboratories, and classrooms, while the rear, 140 by 90 ft., will contain the creamery, facilities for dairy manufacturing research, and instruction laboratories.

South Carolina Station.—The recent conversion of the present Coast Experiment Station into a livestock and forestry station has considerably improved the opportunities for conducting research along these lines. Animal nutrition, pasture problems, and similar studies will be undertaken.

The department of horticulture has added to its facilities a new and much-needed laboratory and storage building.

The station has suffered a severe loss in the recent death of Hon. R. I. Manning, a member of its governing board and a life member of the board of trustees of Clemson College. T. B. Young of Florence has been appointed to succeed him on the governing board.

The station is cooperating with the service clubs of Sumter in formulating a 10-year program for agriculture in the county, and will make studies designed to furnish the basis for the program. There is widespread interest in the project.

EXPERIMENT STATION RECORD

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EDITORIAL

MARTHA VAN RENSSELAER—HOME ECONOMICS PIONEER

By the death in New York City on May 26, 1932, of Dr. Martha Van Rensselaer, home economics education is deprived of a pioneer leader and an able advocate of wide influence in this and related fields. In the words of a message of condolence by President Hoover, "her passing will bring a sense of personal loss to thousands from whom her quiet devotion to every cause looking to the well-being of children and to the enrichment of the life of women had evoked their warm affection and their deep respect."

Dr. Van Rensselaer's immediate service was to her native State of New York and rendered primarily through Cornell University. Born on June 21, 1864, she was graduated from Chamberlain Institute in 1884. After 10 years of teaching in the public schools and 6 years as school commissioner of Cattaraugus County, she was invited by Cornell University about 1900 to organize a service for farm women parallel with the extension courses for farmers already under way. Under the general title of the Cornell reading courses for the home, she first developed a series of popular publications on home economics subjects. From these evolved in due course the Cornell study clubs in home making, the systematic extension activities of the College of Agriculture in this field, in 1907 the organization of a department of home economics in that college, and in 1925 the establishment by legislative enactment of the New York State College of Home Economics.

The "basement room in Morrill Hall with an equipment of a chair or two and a small kitchen table," which marked the beginning, gave way under her leadership and that of her coworkers, Miss Flora Rose and other associates, to an imposing home economics building now nearing completion at a cost of approximately $1,000,000. Her clientele increased from a few scattered individuals to a student enrollment of about 600 annually under her supervision as director of the college and a constituency of many thousands in her capacity as State leader of home demonstration agents. As President Liv-

ingston Farrand of Cornell University has well said, "for 30 years Miss Van Rensselaer has been a notable figure at Cornell. Beginning as an untried worker in an untried field, she laid the foundations of a department which has grown into the College of Home Economics and which will stand forever as her monument."

Dr. Van Rensselaer's service, however, has been in no sense confined by State boundaries. She was among the first to visualize the broad significance of the home economics movement in its relation to society as a whole. She attended the early conferences at Lake Placid, N. Y., out of which developed the American Home Economics Association, and she was long influential in the councils of this body, serving as its president in 1915 and sponsoring the formation of its extension section in the same year.

Particularly of late, she was also an active participant in the conventions of the Association of Land-Grant Colleges and Universities. Her first public utterance in this group seems to have been in 1916, when she pleaded characteristically for the essential parity of home economics with agriculture in administrative matters. She served as chairman of the home economics section in 1929, and rendered effective committee service in a comprehensive study of home economics curricula and in other ways. In 1926 she was elected vice president of the association, and was thus the first and apparently the only woman so far to have had the honor of presiding over the association's general sessions.

During the World War Dr. Van Rensselaer served for some months as chief of the division of home conservation of the United States Food Administration. Subsequently she made a study in Belgium of the needs of women and children, receiving from the King in recognition of her services to child welfare and the education of women and girls the insignia of the order of the Crown of Belgium. In 1930 she was appointed by President Hoover assistant director of the White House Conference on Child Health and Protection, and late in 1931 chairman of the committee on home making, housing, and farm life of the President's Conference on Home Building and Home Ownership.

Thus her service was broad and fruitful and received wide recognition. Her success is not surprising, for, as Dean Betten of Cornell University has recently said, "she combined in striking degree wise judgment, grace of manner, and vigor of administration." She had a unique opportunity and an outstanding experience, and her death adds another to the vacancies that can never be precisely filled.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

On the relation between colloidal and constitutional changes in certain proteins, I [trans. title], W. PAULI and R. WEISS (*Biochem. Ztschr.*, *233* (*1931*), *No. 4–6, pp. 381–443, fig. 1*).—This paper takes up in its first or general part the arrangement of the changes of condition of the proteins according to their reversibility; concomitant alterations of the optical activity of proteins treated with hydrotropic substances, in the cases both of native proteins and of those coagulated by heat, alcohol, heavy metal salts, or acids; alterations with time of the stability of the clear fractions; reversibility after the removal of hydrotropic substances; and some electrochemical-constitutional relationships among the experimental results. An experimental part then takes up the investigational materials, methods, and uniformity of the experimental results as arranged according to the proteins used and the alterations in their condition; and an appendix deals with the "nitroprusside" (nitroferricyanide) reactions of the various denaturation products of ovalbumin. Numerous tabulations of voluminous experimental data accompany the discussion.

On the splitting off of ammonia from amino acids and other substances under ultra-violet light [trans. title], F. LIEBEN and F. URBAN (*Biochem. Ztschr.*, *239* (*1931*), *No. 4–6, pp. 250–256*).—Various amino acid solutions and solutions of some related substances were exposed for two hours to the light of a quartz mercury vapor lamp placed 15 cm vertically above the surface of the liquid to be irradiated. In the case of equivalent solutions of glycine, alanine, aspartic acid, cystine, arginine, lysine dihydrochloride, tyrosine, tryptophane, histidine hydrochloride, the ammonia produced, calculated on the basis of the total α amino nitrogen of the compound under treatment was found to be, respectively, 9.4 per cent, 10.4, 7.3, 32.7, 9.4 (4.7), 20.9 (10.5), 7.1, 14, and 88 per cent. With the exception of the cystine and tyrosine, the amino acids mentioned were in these experiments irradiated in acid solution. Other experiments in which the effects of irradiation in acid, neutral, and alkaline solutions were followed comparatively having shown that decomposition in the alkaline solutions was in general less than that in acid solutions, it is noted that the cystine and tyrosine figures above listed are probably minimal. In acid, neutral, or alkaline solutions the histidine figures were the highest, followed by those for cystine (in alkaline solution).

On the influence of surface-active substances on gelatin [trans. title], A. VON KÜTHY (*Biochem. Ztschr.*, *244* (*1932*), *No. 4–6, pp. 319–341, figs. 5*).—These three papers deal, respectively, with swelling, gel-sol transformation, and optical activity.

I. *Swelling*.—The effect of surface-active substances (specifically that of certain organic salts and nonelectrolytes such as alcohols, urea, etc.) was investigated in comparison with that of such surface-inactive substances as, for example, glucose and inorganic salts. The adsorbability of these various compounds upon gelatin was used as a measure of their effect. Certain of the

surface-active salts, notably a group of hydrotropic compounds, were found to exhibit such an adsorption intensity and capacity as to produce a decided swelling of the gelatin at relatively very low concentrations.

II. Gel-sol transformation.—In general, the substances found in the first group of experiments to increase the swelling of the gelatin increased also the tendency toward gel to sol transformation, whereas those substances which tended to hinder swelling tended to move the gel-sol equilibrium in the opposite direction.

III. Optical activity.—For the most part, the substances above noted as favoring swelling and sol formation decreased optical activity, and those tending to cause shrinking and gel formation increased the optical activity.

Color and precipitation reactions of methylglyoxal [trans. title], H. K. Barrenscheen and K. Braun (*Biochem. Ztschr., 233 (1931), No. 4–6, pp. 296–304*).—The Denigès color reaction with codeine and concentrated sulfuric acid, used also by its author in testing for glycolic acid and for lactic acid (E. S. R., 22, p. 212), was found by the present authors to be of the same sensitiveness for dihydroxyacetone and for glyceraldehyde as for methlyglyoxal, the test giving in each of these three cases a blue-green shade, with a sensitiveness to 1 part in 2,000,000. An absorption band in the red could be seen in dilutions up to 1 in 125,000. Various colors, with degrees of sensitiveness of the test ranging from 1 in 800 in the cases of glucosamine (green) and lactic acid (yellowish-red to yellow) to 1 in 200,000 in the case of unulin (wine red to violet blue), are given for glucose, fructose, mannose, galactose, maltose, sucrose, starch, glycogen, inulin, two ethers of hexosemonophosphoric acid, hexosediphosphoric acid, arabinose, glucosamine, lactic acid, and pyrotartaric acid.

As a test specific for methylglyoxal, its reaction with pure pyrrol and hydrochloric acid (orange-red color) detectable in a comparison with a blank test on distilled water to dilutions of 1 in 250,000 is recommended. Of precipitation reactions, that with 2, 4-dinitrophenylhydrazine was found the most sensitive, its limiting dilution having been found to be that of 1 microgram in 1 cc.

A colorimetric micro method for the determination of methylglyoxal [trans. title], H. K. Barrenscheen and M. Dregouss (*Biochem. Ztschr., 233 (1931), No. 4–6, pp. 305–310*).—The procedure described depends upon the precipitation of methylglyoxal by means of its reactions with 2, 4-dinitrophenylhydrazine, noted in the preceding abstract, and the rearrangement of the resulting dihydrazine affected by its treatment with alcoholic potassium hydroxide. In the case of 0.025 mg in the sample and a dilution to 50 cc, 0.025 mg was found by means of the proposed method. With 0.050 in the sample, 0.04975 was found in a dilution to 100 cc. With 0.100 mg in the sample, dilution to 100 cc, 0.097 mg was found; and with 0.200 mg in the sample, dilution to 100 cc, 0.196 mg was found.

Experiments on the volatility of nicotine [trans. title], V. L. Nagy (*Biochem. Ztschr., 239 (1931), No. 4–6, pp. 324–328*).—The author finds that in the determination of nicotine in tobacco only small quantities (about 10 cc) of such solvents as petroleum spirit or alcohol can be distilled off without the volatilization of significant quantities of the dissolved nicotine. Of ether or of mixtures of ether with petroleum spirit, somewhat more (about 100 cc) than of the higher boiling point solvents could be evaporated without appreciable loss. A loss of 0.6 mg in five minutes from nicotine kept at room temperature was also noted.

Analyses and composition of California lemon and orange oils, H. D. Poore (*U. S. Dept. Agr., Tech. Bul. 241 (1932), pp. 31, fig. 1*).—Besides the

d-limonene, which constituted about 90 per cent of the oil, the following constituents were found in commercial California lemon oil: α- and β-pinene, citral, octylic and nonylic aldehydes, acetic, capric, and caprylic acids, geraniol, γ-terpinene, and sesquiterpene bisabolene. The following substances were not completely identified: A solid aldehyde melting at 58 to 59° C., a tertiary alcohol $C_{10}H_{18}O$, and a white amorphous compound melting at 71 to 72°. Traces of linalool and cadinene were found.

The substances identified in commercial California Washington Navel and Valencia orange oils were practically the same. Besides the *d*-limonene, which constituted 90 per cent or more of the oil, the following constituents were found: Decylic aldehyde; formic, acetic, capric, and caprylic acids; octyl alcohol; an olefin alcohol, $C_{10}H_{18}O$, closely related to linalool; and an unidentified white amorphous compound melting at 62 to 63°. It was indicated that the oils contained a trace of linalool.

The effects of various temperatures, of air, and of light on both lemon and orange oils during storage periods of 20 months were also determined. In all, 73 samples of lemon oil, 63 of Valencia orange oil, and 31 of Washington Navel orange oil, from commercial by-product plants and covering a period of four years, were examined. Summaries of the results were "compared with those of Italian handmade oils, and also with those of California oils made by the sponge method, and in a laboratory machine."

The preparation of crystallized antineuritic vitamin from yeast.—Preliminary report [trans. title], A. WINDAUS, R. TSCHESCHE, H. RUHKOPF, F. LAQUER, and F. SCHULTZ (*Hoppe-Seyler's Ztschr. Physiol. Chem., 204 (1932), No. 3–4, pp. 123–128, pl. 1, fig. 1*).—The general technic followed by the authors is essentially the same as that of Jansen (E. S. R., 62, p. 607), Seidell (E. S. R., 62, p. 711), and Kinnersley, Peters, and Reader (E. S. R., 59, p. 294) and their associates through the stage of adsorption on fullers' earth and removal of inactive material by mercuric sulfate and silver nitrate or by benzoylation. The crude extract thus obtained is neutralized and diluted with water until 100 cc of the solution corresponds to the active material from 50 kg of yeast. To this quantity of the solution is added 50 cc of a 4 per cent aqueous solution of gold chloride. The amorphous precipitate which first forms is immediately removed, and after a short time the gold salt of the vitamin begins to separate in yellow crystals which can be recrystallized on carefully warming with water. The gold salt is then dissolved in water and decomposed with hydrogen sulfide. After filtering off the gold sulfide, the filtrate is evaporated in vacuo and the residue taken up in water and treated with an excess of aqueous picrolonic acid. On standing for a short time clusters of needles are formed which can be recrystallized from water. At room temperature the crystals are needle-shaped, but on heating with a little water they change to a prismatic form. The crystals melt at 229° C., with considerable foaming. They contain sulfur as well as nitrogen. Analysis of the picrolonate suggests the formula $C_{12}H_{18}N_4OS$ as probable, although not proved with certainty. The chloride of the vitamin is prepared by treating the picrolonate with dilute hydrochloric acid, removing the picrolonic acid with ether, evaporating the aqueous solution, dissolving the residue in ethyl alcohol, and treating it with acetone. After a time the chloride crystallizes out, but with a recovery of only about 40 per cent of the theoretical.

The salt is readily … and ethyl alcohol, but insoluble in ether a… Pauly reaction but a strongly positive lea… …ngly alkaline solution with lead acetate. A … …ates with the vitamin

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chloride in water solution are phosphotungstic acid, mercuric chloride, silver nitrate and barium hydroxide, and picrolonic acid, and in alcoholic solution chloroplatinic acid. Among the substances forming no precipitate are picric acid, perchloric acid, silver nitrate, mercuric sulfate in acid solution, lead acetate, flavianic acid, and aqueous chloroplatinic acid.

The absorption spectrum of a 0.02 per cent solution of the chloride in ethyl alcohol shows a maximum at from 250 to 260 mμ. The activity as determined by the pigeon curative test, the material being injected subcutaneously in physiological salt solution, is given as from 0.0014 to 0.0033 mg, with an average of 0.0024 mg, an activity much higher than hitherto reported.

The preparation of crystallized antiberiberi vitamin from yeast [trans. title], R. TSCHESCHE (*Chem. Ztg.*, *56* (*1932*), *No. 17*, *pp. 166, 167*).—In this later report of the investigation noted above, particular emphasis is given to the sulfur content of the purified crystals. The statement is made that on receipt of the earlier paper Jansen had retested his crystalline product, to which he had previously assigned the formula $C_6H_{10}ON_2+HCl$, and found that it contained sulfur. This was confirmed by the author, to whom was sent some of the Jansen-Donath preparation for analysis. The sulfur is considered to be very labile and to be split off as sulfuric acid on treatment with cold permanganate solution or concentrated nitric acid and as hydrogen sulfide on heating with barium hydroxide solution. The instability of vitamin B in an alkaline medium is attributed to the splitting off of sulfur.

The antimony trichloride colour test and the ultra-violet absorption of liver oils and concentrates, A. E. GILLAM and R. A. MORTON (*Biochem. Jour.*, *25* (*1931*), *No. 4*, *pp. 1346–1351*).—On account of the observation made by Morton, Heilbron, and Thompson (E. S. R., 65, p. 804) that the blue solutions obtained by the interaction of liver oils and antimony trichloride sometimes have an absorption maximum of 572 mμ instead of, or in addition to, the maximum at 606 mμ which has hitherto been studied, and that with concentrates a maximum at 583 mμ occasionally occurs in place of or in addition to the more usual band at 620 mμ, a further study was made of the intensities of absorption at 572 and 606 mμ of cod- and other fish-liver oils and at 583 and 620 mμ with concentrates in relation to the 328 mμ. The conclusions drawn are as follows:

"Liver oils contain two chromogens which, with antimony trichloride, give colored substances with absorption maxima at 606 mμ and 572 mμ, respectively. In concentrates these maxima are displaced to 620 mμ and 583 mμ. A comparison of ultra-violet absorption spectra with spectroscopic data on the color test discloses (1) that the parallelism between the intensity of the 606 mμ band and the intensity of the 328 mμ band breaks down so seriously in extereme cases as to render it improbable that the 606 mμ chromogen is vitamin A; (2) that the 572 mμ chromogen and the substance responsible for the 328 mμ band are probably identical; (3) that the blue color for rich oils and concentrates is often much deeper than would be expected on the basis of correlation between blue color and ultra-violet absorption. Hence it is concluded that the matching of blue colors with Lovibond glasses, though it may act as a rough guide to vitamin A potency, is theoretically unsound."

The chemical nature of vitamin B_1 from evidence afforded by its electrical transference, T. W. BIRCH and B. C. GUHA (*Biochem. Jour.*, *25* (*1931*), *No. 4*, *pp. 1391–1396*, *figs. 5*).—Various concentrates of vitamin B (B_1) and crude extracts of yeast were subjected to electrodialysis at different H-ion concentrations in a three-compartment cell and the anode, cathode, and middle fractions tested for activity on pigeons with the technic of Guha (E. S. R., 66, p. 707).

There was no migration of the vitamin from the lead filtrate fraction of yeast subjected to electrolysis at pH 7, but when the pH was adjusted to 4.4 more than half of the activity passed into the cathode compartment, the remainder remaining in the middle compartment. When the cathode solution was reelectrolyzed at pH 8.5, about 50 per cent of the vitamin again migrated to the cathode. Similar results were obtained with a brewer's yeast concentrate and with crude yeast extracts. In the latter there was no evidence of migration of vitamin G (B_2) to the cathode.

It is concluded that vitamin B in both the crude and relatively purified state behaves as a base even at pH 8.5.

The vitamin D problem.—II, Optical rotation of vitamin D, E. H. REERINK and A. VAN WIJK (*Biochem. Jour., 25 (1931), No. 4, pp. 1001–1010, figs. 3*).—The validity of the authors' conclusion that when ergosterol is irradiated under conditions described in the first paper of the series (E. S. R., 62, p. 804) a single substance is formed (which was thought to be vitamin D) was tested by the measurement of the changes in the optical rotation on irradiation. The conditions essential for the formation of vitamin D alone are summarized as the "light used for the irradiation must not contain rays of wave length less than 284 mμ; the irradiation has to be stopped before more than about 50 per cent of the ergosterol has been transformed; oxygen must be completely absent; the solution must be vigorously stirred." The technic followed in carrying out these precautions is explained in detail.

The results of three different series of experiments are reported showing that when the measured values of the rotation are plotted against the relative amounts of unchanged ergosterol the points fall on a straight line, the rotation thus showing a linear dependence on the degree of transformation of the ergosterol. From these experiments the rotation of vitamin D can be calculated as

$$[\alpha]_D = +66.7° \pm 2.7° \quad \text{(in ether)}.$$

The reaction product can be obtained in the crystalline state when the excess of unchanged ergosterol is removed by recrystallization from ether and alcohol in vacuo. One of the preparations had a melting point in a sealed evacuated tube of 115 to 117° C. On analysis it was found to contain 11.3 per cent H and 85.4 per cent C, corresponding closely to an empirical formula of $C_{27}H_{42}O$. The crystals were only slightly hygroscopic, but in contact with air gained weight rapidly by oxidation and changed in color from pure white to a bright yellow. The relation of these crystals to those obtained by Askew et al. (E. S. R., 66, p. 9) and Windaus (E. S. R., 66, p. 7) is discussed

A combination indicator for acidimetry [trans. title], B. GROÁK (*Biochem. Ztschr., 244 (1932), No. 4–6, pp. 294, 295*).—As a combination indicator the author has made successful use of the mixture, saturated alcoholic solution of methyl red 100 cc, 1 per cent medicinal methylene blue 4 cc. Red violet in acid solutions and green in alkaline solutions, this indicator mixture is stated to pass through a colorless stage at the end point, which was found to occur at about pH 5.5. To insure this colorless stage at the end point the indicator required to be used sparingly, not more than 1 drop to each 10 to 15 cc of solution. It is also noted that a yellowish instead of colorless end point is to be corrected by adding a few drops of the 1 per cent methylene blue to the indicator stock solution, while if the end point color be bluish instead of colorless, several cubic centimeters of the saturated methyl red solution are to be added to the indicator stock solution. Too much indicator gave a dirty gray instead of a colorless end point. In the absence of

carbonates, or if the titrating solution be heated to drive out carbon dioxide, the indicator was found to have a sensitiveness such as to permit titration of 0.01 cc of 0.01 N acid or alcohol, and to make full use of the sensitiveness of the indicator, the use either of 0.002 N solutions or of a microburette. For closely similar American work on mixed indicators see a previous note (E. S. R., 66, p. 406).

On the carrying out of the reaction of alduronic acids with naphthoresorcinol [trans. title], C. NEUBERG and M. KOBEL (*Biochem. Ztschr., 243 (1931), No. 4-6, pp. 435-450*).—It is recommended that the naphthoresorcinol reaction with alduronic acids be carried out in 2 N hydrochloric acid or in 50 per cent sulfuric acid rather than, as heretofore, in concentrated hydrochloric acid. This modification of the procedure, and especially the heating of the reaction mixture in a water bath, is said to avoid the separation of the color substance in resinous lumps. Under the specified conditions, the color substance separated in a flocculent condition such as to render it readily extractable by the usual solvents. The lowering of the acid concentration as above recommended also lessened the interference of certain sugars to the extent that glucose, mannose, xylose, arabinose, maltose, and lactose in relative concentrations of 200 of the sugar to 1 of the uronic acid could be permitted. Fructose could be tolerated in the excess of 40 to 1 of galacturonic acid or 30 to 1 of glucuronic acid. Sucrose was permissible up to 50 parts to 1 of the uronic acid.

The iodometric and manometric determination of nitrogen by means of hypobromite [trans. title], A. FUJITA and S. KASAHARA (*Biochem. Ztschr., 243 (1931), No. 4-6, pp. 256-268*).—Both of the two methods of which the working details are here presented are based upon the reaction of hypobromite with ammonia to give free nitrogen and sodium bromide. In the titrimetric procedure the additional reaction, $HOBr+2HI=I_2+HBr+H_2O$, is introduced, and the resulting free iodine is titrated with standard thiosulfate solution. In either case the organic nitrogen compounds are oxidized to ammonium sulfate by digestion with concentrated sulfuric acid with the addition of hydrogen peroxide. The hypobromite-ammonia reaction was found stoichiometric only when the hypobromite was present in an excess sufficient so that but two-thirds of that added was required for reaction with all of the ammonia.

On the gasometric determination of the amino group according to D. D. Van Slyke [trans. title], K. L. ZIRM (*Biochem. Ztschr., 243 (1931), No. 4-6, pp. 310, 311, figs. 2*).—Noting the necessity for using octyl or capryl alcohol to suppress foam in determining the amino nitrogen content of proteiniferous solutions, among others, the author proposes to seal through the upper part of the wall of the reaction vessel of the Van Slyke apparatus (E. S. R., 26, p. 22) the stem of a small dropping funnel to facilitate the introduction of the antifoam. He further finds that in some cases the use of antifoam may be avoided entirely by constructing the apparatus with a platinum wire net of 0.25 mm mesh sealed into the first constriction at the top of the reaction vessel. The last-named device dealt satisfactorily with serum concentrations up to 10 per cent and with 0.8 per cent casein solutions.

A titrimetric method for the determination of amino acids in blood serum [trans. title], K. L. ZIRM and J. BENEDICT (*Biochem. Ztschr., 243 (1931), No. 4-6, pp. 312-315*).—The principle employed is that of the titration of the basic nitrogen groups with alcoholic hydrochloric acid in a solution containing acetone. In applying this principle to the case of serum, a preliminary titration of the substances reacting as bases in water solution after removal of protein by means of colloidal iron hydroxide was introduced, α-naphthyl red being used

both in this and in the following titration in the presence of the acetone. Alcoholic hydrochloric acid was used for both preliminary and final titrations. Aqueous and acetone-containing blanks were run with the determinative titrations in the cases both of the preliminary and of the final determinations.

Colorimetric method for quantitative determination of iron in blood in the form of dispersed Prussian blue, F. REIS and H. H. CHAKMAKJIAN (*Jour. Biol. Chem., 92 (1931), No. 1, pp. 59–63*).—*The essential feature of this* method is the formation of the ferric ferrocyanide in the presence of gum ghatti, which appears to serve as a protective colloid, keeping the blue compound in a dispersed state. Prussian blue thus formed was found practically free from the fading tendency of ferric thiocyanate, and it was also observed to give "a sharper and more delicate comparison." The following statement summarizes the procedure:

"The essential steps are the digestion of 0.2 cc of blood with 1 cc of concentrated sulfuric acid, boiling it for 3.5 minutes, then addition, in two intervals, of 1 cc and 0.3 cc of a saturated solution of potassium chlorate, boiling respectively 3 and 2 minutes; the conversion of the iron into Prussian blue by the addition of 1 per cent of potassium ferrocyanide in gum ghatti solution; finally the colorimetric comparison against a standard solution of ferric sulfate containing 0.1 mg of Fe and 1.3 cc of 6 per cent potassium sulfate."

A colorimetric determination of the potassium content of very small quantities of biological fluids [trans. title], M. DEBGUSS (*Biochem. Ztschr., 233 (1931), No. 4–6, pp. 375–380*).—The primary reaction used was that of the precipitation of the dipotassium sodium cobaltihexanitrite, the corresponding trisodium cobaltinitrite constituting the reagent. The nitrite content of the precipitated complex was then brought into reaction with a reagent containing sulfonilic acid and α-naphthylamine, the color intensity of the azo dye formed being measured in comparison with standards prepared by treating known quantities of potassium chloride in a manner exactly corresponding to that used in the treatment of the sample solutions. Of serum, samples of from 0.05 to 0.1 cc were found sufficient.

On the determination of sodium in organic substances of high potassium content [trans. title], B. SJOLLEMA and J. W. DIENSKE (*Biochem. Ztschr., 243 (1931), No. 4–6, pp. 396–400*).—The authors report experiments showing a wide applicability of the Kolthoff method (E. S. R., 58, p. 608) for the determination of sodium by precipitation as sodium uranyl zinc acetate in the cases both of inorganic and organic materials, but they find that high results are obtained if much potassium be present with the sodium. An alteration of the method, whereby the sodium can be determined accurately even in the cases of admixtures of potassium compounds, is described which involves the removal of much of the potassium as tartrate.

Microchemical soil tests, M. F. MORGAN (*Connecticut State Sta. Bul. 333 (1932), pp. 109–132, pls. 5, fig. 1*).—The author describes micro method modifications of reactions for the determination of soil pH values by means of indicators, of available phosphorus by a form of the ceruleo-molybdate method, of nitrate nitrogen by reaction with diphenylamine and concentrated sulfuric acid, of ammonia nitrogen by reaction with Nessler's reagent, of active aluminum by its combination with the biological stain hematin, and of replaceable calcium by precipitation as the oxalate, of which the nephelometric density is estimated in flat-bottomed vials of specified size by comparing the test suspensions as viewed over black paper with a standard chart. Color charts for the available phosphorus, nitrate, ammonia, and aluminum determinations, and a whiteness-opacity chart for the calcium determination are included in the

bulletin. Against each color is given the corresponding figure in parts per million of the element or radical to be estimated for normal mineral soils, for liquids, and for peat or forest humus.

"Other simple tests may be made by the general technic employed in all of these methods, but it has not been found practicable to develop any relatively simple test for the available potassium in the soil."

Studies on soil reaction.—VII, An electrodialysis apparatus for the determination of replaceable bases in soils, J. K. Basu (*Jour. Agr. Sci.* [*England*], *21* (*1931*), *No. 3, pp. 484–492, figs. 2*).—Continuing this series (E. S. R., 54, p. 719), the assembly described in this contribution from the Rothamsted Experimental Station is a modification of the Bradfield two-compartment cell (E. S. R., 58, p. 717). The present form of the apparatus is designed to lessen the volume of the dialyzate, and is thus described:

"The cell consists of an alundum thimble (R 84 dense, 5.5 cm high and 3.5 cm external diameter) placed on a stout perforated nickel cathode in a Pyrex glass vessel which has a side arm at about 3 cm above the base. The anode is a perforated gold (or better platinum) disk 3.1 cm in diameter and is mounted so as to be immediately over and parallel to the surface of the soil in the alundum thimble. A battery of 6 cells is mounted in recesses in the ebonite top of a stand which carries the necessary terminals and wiring for supplying D. C. current at 110 v, through an adjustable rheostat of at least 500° and an ammeter which may be introduced at will into the circuit of any one cell or of all the cells. Higher voltages may be used with advantage."

Methods for determining carbon dioxide production in soils, F. B. Smith and P. E. Brown (*Iowa Sta. Research Bul. 147* (*1932*), *pp. 25–51, figs. 3*).—"The gravimetric and titrimetric methods for determining the percentage of carbon dioxide in the soil air were found to be entirely unsatisfactory for a number of reasons, chief of which was the difficulty in securing a representative sample of the air for analysis. The volumetric method was found to give fairly satisfactory results, especially in the laboratory. . . .

"The free evolution of carbon dioxide from the soil was found to be a suitable method for studying the effects of certain soil treatments on the rate of carbon dioxide production in soils. A further study of the method is being made comparing it with other methods formerly employed for that purpose. In the free evolution method the 1-l Erlenmeyer flask and 100-g sample of soil are convenient, but larger or smaller samples may be used and smaller flasks may be employed also, provided the incubation period is proportionately shorter. Uniform samples for volumetric analysis can only be obtained by stirring the air in the flask before sampling.

"The results secured by the gravimetric method for determining the amount of carbon dioxide did not check with the volumetric analysis. This was no doubt due to the amount and rate of aspiration. The gravimetric methods in general are not so well adapted to this work, and the volumetric method is recommended where it is possible to use it. . . .

"The Iwanoff fermentation manometer was found unsuitable for measuring the rate of carbon dioxide production in soils. . . . The Barcroft differential manometer appears to be suitable . . . and possesses the advantage that one can follow the rate from time to time. The results secured by this method are consistently higher than those obtained by the free evolution method. This is probably due to the smaller samples of soil and better aeration."

Other details of apparatus and technic are also discussed.

Factors affecting the availability of phosphate fertilizers as shown by the Neubauer method, S. F. Thornton (*Jour. Assoc. Off. Agr. Chem., 15*

(*1932*), *No. 1, pp. 163–166*).—The author of this contribution from the Indiana Experiment Station finds that in the case of neutral sand the availability values obtained by means of the Neubauer method (E. S. R., 50, p. 118) are somewhat similar to those given by the present Official method, being low for tricalcium phosphate, limed superphosphate, highly ammoniated superphosphate, and basic slag. With an acid soil the availabilities of such materials were approximately equal to monocalcium phosphate. Very insoluble phosphates, such as rock phosphate, bone ash, iron and aluminum phosphate, and fluorspar basic slag gave low availability values regardless of the experimental conditions used. The addition of potassium chloride gave higher availability values for all phosphates used.

AGRICULTURAL METEOROLOGY

Organization of an agricultural climatological network in the upper Congo-Nile region [trans. title], H. Scaëtta (*Ciel et Terre, 47* (*1931*), *Nos. 9–10, pp. 219–228, pls. 5; 11–12, pp. 269–276, pls. 2*).—The organization, under the auspices of the Belgian Government, of a system of observing stations in the upper Congo-Nile region, which is stated to be one of relatively dense population and great agricultural possibilities, is described, and its prospective value in connection with climatological and agricultural ecological studies is discussed.

Climatological data for the United States by sections, [November–December, 1931] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 18* (*1931*), *Nos. 11, pp.* [*200*], *pls. 3, figs. 4; 12, pp.* [*200*], *pls. 3, figs. 3*).—These numbers contain the usual brief summaries and detailed tabular statements of climatological data for each State.

Characteristics of cold waves in Utah, W. B. Hales (*Utah Acad. Sci. Proc., 8* (*1930–1931*), *pp. 115–124, figs. 10*).—This paper reports results of a study of preceding and attendant conditions, characteristics, and effects of the nine cold waves which passed over Utah from 1915 to 1930, inclusive.

As to causes, the author concludes that "cold waves over this section of the country are produced as the joint effect of two prominent factors, first, the importation of large masses of dry cold air from the Canadian northwest advancing in front of a well-defined high built up over this region; second, this clear, dry air promotes the process of heat radiation that continues during the passage of the air over the region in question, further accentuating the cooling process to abnormally low temperatures."

It was found that places having the greatest number of cold waves also show the shortest growing season, latest and earliest killing frosts, and lowest mean minimum temperature, as compared with other places of the same elevation. Topographical and other conditions were found to exert modifying or accentuating effects on the cold waves. "Loss of energy by radiation to the cold wave temperatures depends entirely upon the degree of cloudiness above, freedom from dust and smoke particles in the surface layers of air, and the circulation of the air at the surface. Often on a still clear night over a valley floor, the temperature . . . differs as much as 10 to 15° or even 20° over limited areas. On windy nights these temperatures do not differ materially from place to place."

Correlation between frost and the preceding meteorological conditions, B. Ali and S. N. Naqvi (*Indian Jour. Agr. Sci., 1* (*1931*), *No. 6, pp. 671–694, figs. 4*).—This paper is stated to be "the first of a series to determine the correlation between the night minimum temperature at a station and the local

meteorological conditions in the preceding afternoon" in northern India. Equations are developed for making such correlation, and their application in the local forecasting of frosts is reported. The observed and the calculated values of the minimum temperature were found to agree closely in over 93 per cent of the cases. The discrepancies in the remaining cases were not large and are stated to be such that they "can be foreseen and allowed for by a forecaster having the facilities of the Indian synoptic chart." The need of regular afternoon observations of air temperature and humidity under standard conditions of exposure at all agricultural centers as a basis for forecasting minimum temperatures is stressed. Pressure conditions most favorable for the occurrence of frost are also considered.

Agricultural meteorological contributions to the dew problem on the basis of measurements in hop gardens [trans. title], F. ZATTLER (*Wiss. Arch. Landw., Abt. A, Arch. Pflanzenbau, 8 (1932), No. 3, pp. 371–404, figs. 5*).—This contribution to the climatology of hops describes methods of quantitative measurement of dew at different heights in hop gardens, and discusses the influence of the stand of plants and the attendant meteorological conditions on dew formation, as well as the relation of dew to the growth of the hops. A special form of dew trap is described. The results reported indicate in general that the amount of dew may be sufficiently large in some cases to be of value to the hop plants, particularly in dry weather.

Sun spots and midsummer weather, with special reference to predicting the precipitation of the summer of 1932 in Germany [trans. title], F. BAUR (*Fortschr. Landw., 7 (1932), No. 2, pp. 35–36*).—The author makes certain correlations between precipitation in north Germany and sun spot minima covering a long period, from which he concludes that the midsummer of 1932 will be dry. He deduces two rules which he considers of great agricultural importance, (1) that the second summer before a sun spot minimum is likely to be dry in the greater part of Germany, (2) that in the four years immediately preceding and including the sun spot minimum year no three successive years will be wet.

The normal rainfall of Southern Rhodesia, N. P. SELLICK (*Rhodesia Agr. Jour., 29 (1932), No. 1, pp. 2, 12–14, pl. 1*).—A new rainfall map based on records at 250 stations, some of which date back to 1898, is given, with brief explanatory notes. It is shown that "the amount of rain is closely related to the orographic features, the main factors being nearness to the coast and altitude. It also appears that the north is more favored than the south." Approximately one-half of the country has a rainfall of between 25 and 35 in., and about 20 per cent, mainly in Matabeleland, has less than 25 in. "Apart from areas on the eastern border, where winter rains are usual, the whole of the effective rain falls in the period October to April, and in general the October and April rains are small enough to have little effect."

SOILS—FERTILIZERS

Soil conditions and plant growth, E. J. RUSSELL (*London and New York: Longmans, Green & Co., 1932, 6. ed., pp. VIII+636, pls. 7, figs. [54]*).—The present is a further enlargement over the fifth (E. S. R., 56, p. 714) edition, "and has been kept to this limit only by repeated and prolonged examination of the available material," and a compression in which "many meritorious papers have necessarily been passed over." The contents are: Historical and introductory; soil conditions affecting plant growth; the composition of the soil; the soil in nature, (1) changes in its mineral composition; the soil in

nature, (2) the changes in the organic matter; the microorganic population of the soil and its relation to the growth of plants; the biotic conditions in the soil; the soil in relation to plant growth; and methods of characterizing soils; and appendixes I—methods of soil analysis, and II—a selected bibliography of papers on soil conditions and plant growth.

Handbook of soil science, IX, edited by E. BLANCK (*Handbuch der Bodenlehre. Berlin: Julius Springer, 1931, vol. 9, pp. VII+583, figs. 83*).—Volumes 3 to 8 have recently been noted (E. S. R., 66, p. 12). The present volume contains divisions C and D, the methods for the cultivation of the soil, and the soil as a factor in plant growth (plant-physiological soil science). Of these two main divisions many subdivisions are made for detailed treatment. An author index and a subject index conclude the volume.

Principles of soil microbiology, S. A. WAKSMAN (*Baltimore: Williams & Wilkins Co., 1932, 2. ed., rev., pp. XXVIII+894, pls. 15, figs. 84*).—The revision made necessary by the progress of soil microbiology since the publication of the first edition (E. S. R., 57, p. 113) of the present work has included the rewriting of certain chapters, the addition of new chapters, and sufficient condensations of other material to retain practically the same size.

Fiftieth anniversary of the Jordan soil fertility plots (*Pennsylvania Sta. Bul. 273 (1932), pp. 56, pl. 1, figs. 5*).—The bulletin consists of abstracts of the technical papers and discussions presented at the Pennsylvania Soil Fertility Conference (E. S. R., 65, p. 301).

Chemical composition of soils of northwest and west central Texas, G. S. FRAPS (*Texas Sta. Bul. 443 (1932), pp. 25*).—Analyses of various types of soils from 49 counties in northwest and west-central Texas are reported. Methods designed to maintain soil fertility are outlined. The analytical results are considered to show the fundamental basis of the soil fertility of the various types of soil, to indicate their weakness or strength, and to bring out the deficiencies that may probably arise under continued cultivation.

Some saline spots were found in the area, the salts being chiefly sodium chloride, with some sodium sulfate, magnesium sulfate, and magnesium chloride. The soils were found fairly well supplied with nitrogen and phosphoric acid and well supplied with potassium and calcium.

"Nitrogen is the element likely to become deficient first under continued cultivation, and phosphoric acid may become deficient on certain soils."

[Soil Survey Reports, 1927 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1927, Nos. 31, pp. 34, fig. 1, map 1; 32, pp. 46, pl. 1, fig. 1, map 1; 33, pp. 53, fig. 1, map 1*).—The surveys here noted were made with the cooperation, respectively, of the Wisconsin Geological and Natural History Survey and the University of Wisconsin College of Agriculture, the Oregon Experiment Station, and the Department of Conservation and Development of New Jersey and the New Jersey Experiment Station.

No. 31. *Soil survey of Winnebago County, Wisconsin*, A. C. Anderson et al.—Of the 284,160 acres in Winnebago County the greater part occupies a nearly level plain. The soils are classified as 13 series comprising 24 types. Of these, Poygan silty clay loam occupies 26 per cent of the soil area and is followed by Superior clay loam 20, Kewaunee silty clay loam 12.6, and Houghton muck 12 per cent.

No. 32. *Soil survey of Marion County, Oregon*, E. F. Torgerson and T. W. Glassey.—The soil area surveyed in Marion County consists of 542,080 acres in the northwestern part of the State, the more mountainous eastern part of the county within the boundaries of national forests having been excluded. "The surface is marked by a variety of topographic features ranging from

narrow canyons to wide stream bottoms and from broad smooth valleys to rolling hills and steep mountain slopes."

The soils found are here listed as 32 classified types of 21 series, with 19.8 per cent of rough mountainous and rough broken and stony lands. The most extensive types are Olympic clay loam, amounting to 12.3 per cent of the total area examined, and Willamette silt loam, of which there was found 12.2 per cent.

No. 23. *Soil survey of the Freehold area, New Jersey*, L. L. Lee and J. E. Tine.—The Freehold area, comprising the northern part of Monmouth County and a small part of Middlesex County, covers 195,840 acres northeast of the center of New Jersey. The area lies within the Atlantic Coastal Plain, has a varied surface configuration, and its soil development "takes place under the influence of the podsolic process."

The soils of this area are classified as 7 series inclusive of 35 types, of which Collington sandy loam leads in areal extent with 11.5 per cent of the total soil surface. Collington loam follows with 10.6 per cent, and percentages totaling 14.6 per cent are listed as meadow, muck, tidal marsh, coastal beach, and made land.

[**Soil Survey Reports, 1929 Series**] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1929, Nos. 3, pp. 40, fig. 1, map 1; 4, pp. 35, fig. 1, map 1*).—The two surveys here noted were carried out with the cooperation of the University of Nebraska State Soil Survey Department.

No. 3. *Soil survey of Stanton County, Nebraska*, F. A. Hayes et al.—Located in northeastern Nebraska, Stanton County occupies 273,920 acres in the prairie region. The greater part of the county consists of a rather severely eroded loess-covered plain, locally modified by rolling or hilly sandy areas and intersected by numerous strips of alluvial land. The county is very generally well drained. The soils are mapped and described as 15 series, represented by 35 types, of which the most extensive is Moody silt loam occupying 48.5 per cent of the area.

No. 4. *Soil survey of Dixon County, Nebraska*, A. W. Goke and L. A. Brown.—Covering an area of 302,080 acres in northeastern Nebraska, Dixon County lies in the "loess-hill area" of the State, and represents a wide range of topographic features, from alluvial lands and nearly level uplands to rough and broken tracts. Drainage is well established throughout the greater part of the county.

Moody silt loam, occupying 47.1 per cent of the entire area surveyed, is the most extensive among 23 types representative of 13 series.

Sorption phenomena in soils and in silica gels, E. D. DePARAVICINI (*Soil Sci., 33 (1932), No. 3, pp. 163–181, figs. 9*).—The obscurity of many absorption and adsorption reactions, especially in soils, having led in the opinion of the author of this contribution from the University of Oxford to some degree of confusion in the use of terms, the word "sorption" is here used "to avoid the implication of any precise physical interpretation" as meaning "the total removal of cation both by exchange and by ab- or adsorption."

The experimental work reported consisted of conductivity measurements and pH measurements made upon aqueous suspensions of soils and of silica gels with a view to the correlation of these results with those obtained with samples previously subjected to a heat treatment.

Addition of neutral chloride solutions increased the acidity of soil and gel suspensions but effected a simultaneous decrease in conductivity, indicating a sorption of ions greatly in excess of those taking part in "base exchange." In the sorption reactions studied, there was immediate attainment of equilibrium. Different cations were shown to displace hydrogen preferentially; but

experiments on a "hydrogen" soil and on silica hydrogel showed equivalent sorption of the cations sodium, potassium, magnesium, and calcium. For five typical soils, an optimum temperature, between the limits 110 to 150° C., was found to give maximum values for the acidity and conductivity of resulting suspension and also for subsequent sorption of cations. For silica hydrogels, however, the effects appeared to be completely reversible.

Relations of buffer capacity for acids to basicity and exchangeable bases of the soil, G. S. Fraps and J. F. Fudge (*Texas Sta. Bul. 442 (1932), pp. 54, fig. 1*).—This bulletin discusses methods of measuring buffer capacity, together with the relation of the buffer capacity to the carbonates, to exchangeable bases, and to other properties of the soil. "If unsuitable methods are used, the mixtures of soil may be acid even though undecomposed carbonates remain. The adequate expression of the buffer capacity of soil requires the construction of a curve, or statement of the total buffer capacity to a definite degree of acidity (pH) and of the specific buffer capacity between given pairs of pH values. The addition of soluble salts to an acid soil may increase its acidity; washing out soluble salts may decrease its acidity." Various methods for the determination of the lime requirement were studied with reference to their accuracy in indicating the quantity of acid added to the soil.

The experimental work and discussion cover the following subjects: Method used for buffer capacity, estimation of carbonates, effect of time on the action of acid on the soil, influence of time of contact on amount of acid consumed by soils high in carbonates, influence of time of contact on acidity of soils high in carbonates, types of buffer curves of soils, effect of washing out the electrolyte upon the buffer capacity, effect of potassium chloride on the buffer capacity, effect of potassium chloride with the acid upon the buffer capacity, quantitative relations of the acidity of the residue to the quantity of acid used, acidity of soil residue in terms of exchangeable hydrogen, relation of carbonates to the buffer capacity, relation of the base-exchange complex to buffer capacity, effect of acid on the exchange complex, relation between the acid-consuming power and the base-exchange capacity of the soil, replacement of exchangeable bases by hydrogen, nature of the base-exchange complex, relation between certain other soil factors and total exchange capacity, influence of soil material other than carbonates and base-exchange complex on buffer capacity, and method for basicity of liming materials and fertilizers.

The effect of air drying on the hydrogen-ion concentration of the soils of the United States and Canada, E. H. Bailey (*U. S. Dept. Agr., Tech. Bul. 291 (1932), pp. 44, figs. 2*).—A group of 327 "moist horizon samples from 64 representative virgin profiles from widely scattered parts of the United States, from Puerto Rico, and from Canada" were examined for H-ion concentration on arrival at the laboratory and again after air drying, by means of the bubbling hydrogen electrode. "Twenty soil profiles, or 31 per cent of the profiles studied, showed a change of more than 0.10 pH unit on air drying. Forty-two horizon samples, or 13 per cent of the total number examined, changed more than 0.10 pH unit. Only 2 of the 64 profiles studied contained horizons that changed 0.50 pH unit or more. When the change exceeded 0.10 pH unit, it was in the direction of greater acidity, with only two exceptions. With few exceptions the greatest change on drying took place in the layers high in organic matter. With only one exception the horizon samples that changed more than 0.10 pH unit on becoming air-dry were acid in reaction. . . . The most important factor affecting the changes in reaction from air drying appears to be the amount of acid organic matter present in the sample.

"The general conclusion is that hydrogen-ion determinations should be made on air-dried soils rather than on samples fresh from the field."

Characteristics of dispersable organic colloids in peats, W. L. Powers (*Jour. Agr. Research [U. S.], 44 (1932), No. 2, pp. 97–111*).—From 26 soil-layer samples obtained from 8 peat profiles the author of this contribution from the U. S. D. A. Bureau of Chemistry and Soils extracted colloidal organic substances in quantities such as to indicate that "it is possible to separate organic colloids from peat with fairly good, though scarcely quantitative, yields." The material obtained, exposed over 3.3 per cent sulfuric acid, absorbed water amounting to about 50 per cent more than the average of that taken up by inorganic soil colloids. The proximate composition of the peat colloids varied widely from one to another parent material or climatic condition. The colloid fraction showed a nitrogen content higher than that of the peat from which it was separated.

"Although the base-exchange capacity of peat is large, its colloid fraction gives much higher values. The ligneous fraction of the peat colloid, although manifesting comparatively good base-exchange capacity, appears to have this property largely destroyed by treatment with hydrogen peroxide.

"Plant materials manifest base-exchange capacity in different degrees, which may affect their comparative values for green manure or stable litter. Studies with composts show a concentration of ligneous material as decomposition proceeds, and this is correlated with increased base-exchange capacity. The state of the colloid, or of its ligneous fraction, appears to be conditioned for higher base adsorption by additions of sand, clay, or calcium carbonate." The formation of addition complexes, or the freeing of double-valence bonds, seemed probable.

The decomposition of vetch green manure in relation to the surrounding soil, H. Humfeld and N. R. Smith (*Jour. Agr. Research [U. S.], 44 (1932), No. 2, pp. 113–120, fig. 1*).—The authors report a study of the decomposition of green vetch in a naturally acid and in a limed Leonardtown clay loam, as a contribution from the U. S. D. A. Bureau of Chemistry and Soils, the experiments extending similar work earlier reported (E. S. R., 66, p. 317). Representative samples of each layer obtained were analyzed by plate count on soil-extract agar for number of microorganisms, for number of protozoa, and for content of ammonia nitrogen, nitric nitrogen, and moisture. The soil pH and carbon-dioxide evolution were also determined.

The increases in numbers of bacteria and protozoa were found limited almost entirely to the green-manure layer. The soil layer acted to insure more or less uniform conditions of temperature and moisture, and as an absorbent for the ammonia produced in the decomposition of the green manure. "In all probability the soil was the material in which nitrification of this ammonia took place. It was also found that rapid nitrification took place even in the very acid soil and that an accumulation of nitrates occurred at the surface.

"The pH of the green manure was shown to be higher than the pH of the surrounding soil during the period of active decomposition. Carbon dioxide production was correlated with microbial activity and was considered to be a good indicator of such activity under the conditions of the experiment."

The effect of temperature upon nitrogen fixation by Azotobacter, R. A. Greene (*Soil Sci., 33 (1932), No. 3, pp. 153–161, fig. 1*).—The nitrogen-fixing activities of *Azotobacter agile*, *A. vinelandii*, *A. vitreum*, *A. woodstownii*, *A. beijerinckii*, and *A. chroococcum*, and of seven cultures not assigned to any named species, were measured at 18, 23, 27.5, 30, 32.5, 35, 37.5, 40, and 42.5° C. in the experiments reported in this contribution from the University of

Arizona. The culture medium consisted of 100 g of sterilized sand so placed in 100 cc of Ashby's solution that a slant of sand extended well above the surface of the liquid. In addition to its inoculum, each of these cultures received 1 g of sterilized calcium carbonate. The cultures were incubated 14 days. The following statements summarize the observations recorded:

"*A. agile* is the most active nitrogen fixer, with *A. vinelandii* a close second. *A. beijerinckii* and *A. chroococcum* are next in order. *A. vitreus* and *A. woodstownii* were not active fixers at any temperatures. The seven cultures of Azotobacter isolated from Arizona soils fixed greater quantities of nitrogen at all temperatures except at 18° C.

"In general, greatest fixation occurred at 32.5° C. *A. agile*, *vinelandii*, and *chroococcum* were quite active at 35° C. Although the cultures from Arizona soils fixed the greatest amount of nitrogen at 32.5°, they were very active at higher temperatures. The quantities of nitrogen fixed by them at 40° C. were approximately the same as those fixed at 27.5° C. The maximum temperature for fixation was 40° C. The Azotobacter flora of Arizona soils have been subjected to high temperatures for a long period of time. Data presented in this paper indicate that they have become adapted to this environment, and consequently are able to fix nitrogen at higher temperatures than cultures of Azotobacter which come from soils of more temperate regions."

The use of fertilisers in tropical and subtropical agriculture, A. Jacob and V. Coyle (*London: Ernest Benn, 1931, pp. 272, figs. 101*).—Of the two parts into which the book is divided the first, following a brief introduction, takes up fertilizers and their relation to plant growth in the five chapters, functions of the various fertilizer constituents in the plant, composition of tropical soils, the different classes of fertilizers, method and time of application of fertilizers, and general conduct of manurial experiments in plantations. Part 2 is devoted to the manuring of tropical and subtropical crops, its 14 chapters taking up general groups and individual crops.

The composition and fertilizing value of sewage sludge, G. S. Fraps (*Texas Sta. Bul. 445 (1932), pp. 23*).—The two processes yielding, respectively, digested and activated sludge are briefly described. The remainder of the bulletin reports analyses as to the fertilizing and other constituents of sludges, and discusses the availability of the nitrogen of sewage sludge, the results of pot tests to estimate the availability of the nitrogen in sludge, the nitrification of sewage sludge, and the utilization of sewage sludge.

"Dried activated sludge is a nitrogenous fertilizer similar to cottonseed meal and has about seven-tenths of its value. It can be used alone or in the preparation of mixed fertilizers.

"Dried digested sewage sludge contains somewhat more plant food than farmyard manure but is a poorer source of humus. The availability of its nitrogen is about half that of cottonseed meal. It can be utilized in field or garden crops in the same way as farm manure by those sufficiently near to a sewage disposal plant to be able to haul it at a low cost."

Work on potassium fertilizers, O. Eckstein, A. Jacob, and F. Alten (*Arbeiten über Kalidüngung. Berlin: Verlagsgesell. Ackerbau, 1931, pp. 237, figs. 73*).—This book is an account of certain work of the Berlin-Lichterfelde Agricultural Experiment Station, including the problems of the special agricultural experiment station for potash investigations; the equipment and arrangements of the station; soil profiles and soil map of the station's lands; and the work of the station, occupying nearly two-thirds of the total volume.

Some chemical and bacteriological effects of various kinds and amounts of lime on certain southern Iowa soils.—Part I, Laboratory and green-

house experiments, R. H. Walker, P. E. Brown, and A. W. Young (*Iowa Sta. Research Bul. 148 (1932), pp. 57-120, figs. 12*).—The first, or historical, section of the bulletin summarizes a large number of published investigations as regards the effects of various kinds and amounts of lime on the H-ion concentration and lime requirements of soils, on the exchangeable hydrogen, exchangeable bases, and the degree of saturation of soils, on bacterial activities in soils, and on crop yields and composition. The second, or experimental, section reports five series of experiments on the effects of various amounts of chemically pure calcium carbonate and quarry-run limestone on Grundy silt loam, Shelby loam, and Tama silt loam; and the effects on Grundy silt loam of limestone of different degrees of fineness and of calcium and magnesium carbonates and limestones.

"A close relationship was found between the buffer capacity of the Grundy silt loam, the Shelby loam, and the Tama silt loam as measured by titration curves, and the content of colloidal matter and organic carbon in the soils. The titration curves, as employed in these tests, were considered a good measure of the buffer capacity of these soils.

"A comparison of quarry-run limestone and chemically pure calcium carbonate showed that the former was not nearly so effective as the latter for the neutralization of the acidity of the three soils tested. Between 3 and 4 tons of pure calcium carbonate per acre were sufficient to bring the reaction of the Grundy silt loam up to pH 7.0 in 3 months. Where quarry-run limestone was applied to the same soil a little over 9 tons of lime raised the pH to only 6.65. . . .

"These results indicate that the degree of fineness and also the chemical composition of the lime used have a large influence on its reaction with the base exchange complex of soils. . . .

"The effects of various amounts of quarry-run limestone on nitrification in Grundy silt loam were also determined. The results obtained indicate very definitely that nitrification was stimulated in the Grundy silt loam by additions of limestone. Greater effects were secured with the larger amounts of limestone up to the addition of 6 tons per acre.

"Sweetclover was grown in pots of Grundy silt loam similarly treated with varying amounts of quarry-run limestone. While the effects of the limestone on the yield and nitrogen content of the crop were not large, the results indicate that the application of limestone to this soil was beneficial. It increased both the yield and the total amount of nitrogen in the crop. The maximum effects of the limestone were secured in the soil treated with limestone at the rate of 3 tons per acre. This amount corresponds very closely to the lime requirement of the soil. . . .

"Both the calcium and magnesium carbonates and limestones increased the yield of wheat over that secured on the untreated soils, but the magnesium carbonate and also the dolomitic limestone were slightly more effective than the calcium carbonate and calcium limestone, respectively. The differences in nitrogen content of the wheat crop were hardly large enough to be significant. Magnesium carbonate was somewhat more effective than calcium carbonate in increasing the crop yields and the nitrogen content in the clover crop. Similarly, the dolomitic limestone seemed to have a greater effect than the calcium limestone. The differences, however, were greater when the two carbonates were compared than in the case of the two limestones."

Inspection of agricultural lime products, H. D. Haskins and H. R. DeRose (*Massachusetts Sta. Control Ser. Bul. 61 (1931), pp. 6*).—This annual report on liming materials reports analyses of 12 hydrated limes, 13 ground limestones, and 1 gypsum.

Inspection of commercial fertilizers for 1931, T. O. SMITH and S. J. FISHER (*New Hampshire Sta. Bul. 263 (1931), pp. 15*).—This report of fertilizer inspection analyses shows the percentage of guaranties not met reduced from 13 per cent in 1930 (E. S. R., 64, p. 724) to 11.7 per cent in 1931.

Analyses of commercial fertilizers and ground bone; analyses of agricultural lime, 1931, C. S. CATHCART (*New Jersey Stas. Bul. 536 (1932), pp. 30*).—Statistical information referring to various phases of the registration and sale of fertilizer materials in New Jersey is accompanied by the usual tabulated analyses.

Fertilizer registrations for 1932, C. S. CATHCART (*New Jersey Stas. Bul. 538 (1932), pp. 22*).—This bulletin contains the usual annual tabulation of fertilizer registrations and guaranties.

AGRICULTURAL BOTANY

Plant material introduced by the Division of Foreign Plant Introduction, Bureau of Plant Industry, July 1 to September 30, 1930 (*U. S. Dept. Agr., Inventory 104 (1932), pp. 35*).—Descriptive and economic notes are given of 778 lots of plants and seeds introduced for testing in various parts of the United States.

A method for growing plants under sterile conditions, A. ÅSLANDER (*Svensk Bot. Tidskr., 24 (1930), No. 1, pp. 111, 112, fig. 1*).—This method, which is described as to its set-up and use, is said to be suitable also for water cultures. By use of a siphon the nutritive solution may be completely drained off and renewed.

Plant growth in electric light [trans. title], S. ODÉN (*K. Landtbr. Akad. Handl. och Tidskr., 68 (1929), No. 7, pp. 899–1057, figs. 72; Eng. abs., pp. 1031–1034*).—This account presents a review of previous related studies, a survey of practical possibilities in the use of electric illumination in promoting the growth of garden plants, and a summary of results obtained in the two winter seasons 1927–28 and 1928–29 by the Swedish Central Agricultural Experiment Station in collaboration with the horticultural garden of the Royal Academy of Agriculture. This work is summarized by chapters in English, and an extensive bibliography is supplied.

"It is pointed out that the time for advantageous use of artificial radiation is dependent on the geographical position and the amount of solar radiation naturally received. Artificial light must be used as a supplementary source in order to obtain the proper length and intensity of daily illumination."

Electrical effects accompanying the decomposition of organic compounds, considered in relation to photosynthesis and plant nutrition, M. C. POTTER (*Zentbl. Bakt. [etc.], 2. Abt., 78 (1929), No. 1–7, pp. 56–65*).—It is stated that an electromotive force is inseparable from any chemical reaction between organic compounds. Part of the energy stored up in the plant must be electric. The signs in catalysis are opposite to those in synthesis. This e. m. f. originates in the chemicophysiological reactions involved in the life processes of the plant and constitutes an index of its vitality. The gases concerned are ionized. Electric energy supplied by ionized gases factor essentially in photosynthesis. The modification of electric potential near trees when in foliage accords with the view that ionized gases are needed for photosynthesis. Catalytic and synthetic enzymes rendering energy kinetic and potential, respectively, are discussed with hypothetical differences. Endoelectric and exoelectric reactions analogous to endo- and exothermic reactions are suggested.

An e. m. f. is produced during the decomposition of all organic matter in soil and in water. Some evidence is brought forward that the plant uses this source of energy during the various stages of its growth. It is held that the conditions of static electricity existing normally in the plant, the atmospheric ionization, and the e. m. f. in the soil must necessarily be taken into account in estimating the effect of electrical discharges upon plant growth.

The relation between water content and amount of photosynthesis, J. G. Wood (*Aust. Jour. Expt. Biol. and Med. Sci., 6 (1929), No. 2, pp. 127–131, fig. 1*).—This paper describes preliminary work with time factors in photosynthesis, including the changes in the amount of carbon assimilation with age in the case of cherry-laurel (*Prunus laurocerasus*) leaves and the effect of varying light intensities and different temperatures. Tables and curves are shown.

While the leaf contains much water, the assimilation rate is low due to the slow carbon dioxide diffusion rate. When nearly all of the water of injection has disappeared from the intercellular spaces, the carbon dioxide diffusion rate rises abruptly to normal and then remains constant over the period during which a decrease occurs in the leaf weight of one-tenth its fresh weight.

[**Response of plants to water deprivation or to insufficient water supply**], P. M. Tikhonov (Tichonow) (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 7 (1930), No. 2, pp. 99–122, figs. 2; Ger. abs., p. 121*).—Tests of five oat and four wheat varieties as to peculiarities of behavior in regard to the water factor are outlined. The drying capacity was established by the method of direct drying.

Varieties having the higher drying capacity showed also a greater imbibition capacity in the cells and a higher content of soluble carbohydrates at the beginning of the drying out, as well as a more deeply ranging root system. The connection of drying capacity to the daily process of evaporation and to the work of the stomatal apparatus was not clear. A greater stability of the plasma in relation with water deprivation did not indicate a better resistance of a given variety against diminution of water in the experiments on vegetative growth.

[**Functional relations between phosphorus compounds and organic acids in plants**], T. Demidenko (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 7 (1930), No. 2, pp. 123–133; Ger. abs., p. 133*).—Both compositions and quantities are dealt with in detail as regards the joint influences of phosphorus compounds and organic acids in sterilized or unsterilized plants, including legumes, buckwheat, mustard, and cereals.

[**The influence of phosphorus and of day length on physiological functions in plants**], Z. M. Éidel'man (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 7 (1930), No. 5–6, pp. 387–402, figs. 6; Eng. abs., pp. 400, 401*).—A study is outlined of the relations observable between certain physiological functions (photosynthetic activity, respiration, and chlorophyll formation) in plants and length of day in connection with varying phosphorus supply.

Photosynthetic activity tends to show positive correlation (coincident maxima) with phosphorus content, also with dry weight, at average day length and relatively high temperature. The maxima, however, no longer coincide under conditions of a shortened day and lowered temperature. Still the correlation coefficient in general remains positive and fairly high between photosynthetic activity and dry mass.

Respiration energy usually changes but little with alteration in amount of phosphorus. Correlation between PO_4 and physiological energy remains practically constant in case of permanent solutions or after periodical renewal of solutions.

Chlorophyll varies approximately inversely with phosphorus content, especially for daylight lengths of 6, 12, and 15 hours. Phosphorus absorption increases with the percentage of phosphorus present and with increase of the light-duration period during each 24 hours, light thus favoring phosphorus absorption.

Flowering behavior of the hog peanut in response to length of day, H. A. ALLARD (*Jour. Agr. Research [U. S.], 44 (1932), No. 2, pp. 127-137, figs. 4*).—The hog peanut, *Falcata comosa* (*Amphicarpaea monoica*), is said to produce several types of flowers ranging from showy blue or white blossoms to strictly cleistogamic flowers. Experiments are reported in which plants were grown under regulated exposures to daylight.

Response to light conditions showed that the blue aerial perfect flowers can develop only when the days are not less than 13.5 hours long. The greenish aerial cleistogamic flowers and the extremely rudimentary cleistogamic type of flower borne on the slender, filiform, nearly leafless stems and giving rise to hypogean pods were able to develop under all lengths of day from 5 to 13.5 hours. It is believed that the upper limit inhibiting this development lies somewhere between 13.5 and 15 hours, the maximum length of day of the Washington region. This is also indicated by the fact that control plants did not produce these hypogean flowers until late July or early August.

The use of weak electric light to supplement the short days of winter inhibited the development of the winter form of aerial cleistogamic flowers. It did not entirely inhibit the development of filiform stems bearing the extremely rudimentary hypogean flowers when the additional light was withheld until 17 days after germination. In this case no hypogean beans were developed, and the filiform stems finally died.

In the field, length of day seems to operate in fixing the more or less regular seasonal incidence of the several forms which appear to be derived from the normal blue flowers of the species, by graduations of reduction of the floral structures until the extreme hypogean type is attained. This is considered to indicate that the seasonal factor of length of day is a potent influence in determining the kind of flowers that the hog peanut will produce.

Physiological derangements in vines subsequent to injury by cold, J. G. WOOD (*Aust. Jour. Expt. Biol. and Med. Sci., 6 (1929), No. 2, pp. 105-106, pl. 1*).—This paper records symptoms of the twofold injury caused in currant and sultana vines by the so-called black frost in the irrigation areas in the Murray Valley in September, 1927, consisting in the killing of shoot tissues and in the subsequent falling of the blooms produced from the dormant buds. Observations and material were obtained at Renmark, Berri, Monash, and Barmera in South Australia, and at Mildura and Red Cliffs in Victoria.

The damage was caused by a shallow drift of cold air about 5 ft. above ground level, which rolled over the country on September 25, 1927, the air temperature ranging, in most cases, from 8 to 12° F. below freezing. The nature of the injury is said to have been quite different from that caused by ordinary frosts, which is confined to the leaves and young shoots, as in this case much of the woody tissue was altered and killed. Microscopic examination showed a killing of the parenchyma cells of the cortex, of the medullary rays, and of the pith, followed by torsion and laceration of the wood elements, as a direct result of the low temperature.

The second developmental stage of the trouble was the appearance of a black spot or streak on the main axis, its rapid spread resulting in the death of the whole inflorescence. No insect puncture or fungus attack could be detected. The course of tannin development and cell behavior are detailed as resulting in the death of tissues and of parts.

The course of dextrose metabolism and nitrogen fixation by Azotobacter, P. G. Krishna (*Centbl. Bakt. [etc.]. 2. Abt., 76 (1928), No. 8–14, pp. 228–240, fig. 1*).—It appears that accumulation of metabolic products does not lower nitrogen fixation by Azotobacter. Variation in the numbers of Azotobacter cells introduced into the medium had no perceptible effect on nitrogen fixation during incubation lasting for two weeks, nor had variations in dextrose concentration. The quantities of dextrose used and nitrogen fixed increased progressively with prolongation of the incubation period so long as energy-furnishing material was available, though the quantities of dextrose used varied from day to day. A period of intense activity was followed by a decided slowing down. A fair degree of correlation appeared between daily dextrose consumption, nitrogen fixation, and carbon dioxide evolution, this fact showing supposedly that the period of greatest cell multiplication and that of greatest energy utilization coincide with that of greatest nitrogen fixation. The maximum of carbon dioxide evolution occurred between the third and sixth day for three strains of Azotobacter. The optimum reaction range lay between pH 6.8 and 8.4, the limit on the acid side being between pH 5.8 and 5.9. Between 65 and 70 per cent of the carbon in the dextrose consumed was given off as carbon dioxide. These values were fairly constant. The ratio between total carbon assimilation and nitrogen fixed by Azotobacter was found to be 35 or 36 : 1. The carbon-nitrogen ratio within the Azotobacter cells was between 6.5 and 8 : 1.

The assimilation of nitrogen by pure cultures of Clostridium pasteurianum and related organisms, E. McCoy, W. M. Higby, and E. B. Fred (*Centbl. Bakt. [etc.], 2. Abt., 76 (1928), No. 15–24, pp. 314–320, fig. 1*).—When 37 representatives of the anaerobic butyric acid-forming bacteria of the soil were isolated in pure culture and tested for assimilation of free nitrogen, these bacteria showed a wide variation in this respect. Representatives of the butyl alcohol-forming bacteria, *C. acetobutylicum*, fixed comparatively little nitrogen. Numerical data are indicated.

A study of the course of nitrogen fixation and sugar utilization by a single cell culture of *C. pasteurianum* is detailed. Though the relative efficiency in nitrogen assimilation apparently varies with the stage of growth, there appears to exist a general correlation between the assimilation of nitrogen and the consumption of sugar.

Assimilation of phosphorus and of potassium by sprouts and by young seedlings of rye [trans. title], S. Hołyński (*Pam. Państ. Inst. Nauk. Gosp. Wiejsk. Puławach (Mém. Inst. Natl. Polon. Écon. Rurale Puławy), 10 (1929), No. 1, pp. 163–174, figs. 3; Fr. abs., pp. 173, 174*).—The assimilation curves of rye for P_2O_5 and K_2O are analogous, though the assimilation rate of the former is the slower. Each shows a minimum assimilation rate which occurs for P_2O_5 about 5.3, for K_2O about 4.5 days after the sowing. The greater part of the phosphorus is assimilated in about 6 to 15 days after seeding, of the potassium in about 5 to 12 days. The quantities of each assimilated and showing in harvest depend upon their respective concentrations in the medium. Loss of either from the seed diminishes in proportion to the amount of that element already contained in the soil.

The distribution of manganese in plants, and its importance in plant metabolism, W. B. S. Bishop (*Aust. Jour. Expt. Biol. and Med. Sci., 5 (1928), No. 2, pp. 125–141*).—The persistent occurrence of manganese in plants and its localization in certain portions are proved by ash analyses. The concentrations in the regions of most active chemical change suggest that manganese is essential to plant metabolism. It is claimed to have been shown by care-

fully controlled experiments that manganese is essential to plant development, though the manganese concentration must be carefully controlled to obtain beneficial results. The manganese effect is claimed not to be due to the reduction of iron absorption by the plant. Manganese is related to chlorophyll formation, and hence to carbon assimilation. Calcium definitely counteracts the toxicity of high manganese concentrations.

Biology and physiology of ergot [trans. title], H. KIRCHHOFF (*Centbl. Bakt.* [etc.], *2. Abt.*, *77* (*1929*), *No. 15–24, pp. 310–369, figs. 22*).—A detailed study, with bibliography, is presented of Claviceps in two main parts, one developmental and biological, and the other detailing studies of the fungus, chiefly in artificial culture.

GENETICS

Cytological studies on Triticum and Aegilops.—II, On the genus crosses between Triticum and Aegilops, F. KAGAWA (*Japan. Jour. Bot.*, *4* (*1928*), *No. 1, pp. 1–26, pls. 7*).—An account with details of results is given of cytological studies on crosses between *T. vulgare* and *A. cylindrica*, and also between *T. durum* and *A. ovata*.

Cytological studies on pollen sterility in apple varieties [trans. title], O. HEILBORN (*Svensk Bot. Tidskr.*, *22* (*1928*), *No. 1–2, pp. 185–199, figs. 3*).—The author concludes that the inferior germination capability of pollen in many apple varieties is ascribable to inappropriate chromosome numbers, partly also to sensitivity of the reduction division to temperature elevation, and possibly to other influences.

Microsporogenesis and embryogeny in certain species of Bromus, P. BECK and J. S. HORTON (*Bot. Gaz.*, *93* (*1932*), *No. 1, pp. 42–54, figs. 29*).—*B. marginatus* is octaploid and *B. rubens* tetraploid, whereas *B. villosus* is variable between octaploid and decaploid, according to studies at the University of Redlands, California. Polyploidy and other irregularities in the maturation division indicated that these species may be hybrids. Lagging bivalents were found in *B. villosus* and *B. marginatus*. An irregular homeotypic division showing much lagging and extrusion was observed in *B. villosus*, while varying types of chromatin extrusion were found in all three species, together with polycary and sterile pollen. No examples of cytomyxis were observed. Megasporogenesis and embryo sac development appeared to be rather typical for the Gramineae.

The glossy character (gl_1) in maize and its linkage relations, H. L. THOMAS (*Jour. Agr. Research* [*U. S.*], *44* (*1932*), *No. 2, pp. 167–173, figs. 2*).—Inheritance studies with corn at the Minnesota Experiment Station placed glossy seedling gl_4 noted earlier by Hayes and Brewbaker (E. S. R., 59, p. 126) into the *su–Tu* linkage group in the order $su–gl_4–Tu$. The homozygous glossy condition gl_4 appeared to have little, if any, effect on the general vigor of a corn plant. The true difference between normal and glossy seedlings seemed to lie in the leaf cuticle.

Aesthetic notions in animal breeding, W. VAN RIPER (*Quart. Rev. Biol.*, *7* (*1932*), *No. 1, pp. 84–92*).—Attention is called to the lack of relationship of ideal form to function in a number of types of animals, with special reference to pigeons.

Investigations on the inheritance of the amount of milk and fat in the Von Lochow commercial herd in Zieckau [trans. title], E. LEBKEL (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol.*, *21* (*1931*), *No. 1, pp. 11–47, figs. 4*).—An analysis is reported of the milk and fat production of 140 cows in 415 lactation periods with reference to age, month of calving, and duration of

lactation and dry periods. The records are considered with reference to the 3-factor hypothesis of Von Patow (E. S. R., 64, p. 727), with good agreement. It appeared that the factors for milk and fat production were independent and not sex linked.

The inheritance of resistance to Salmonella aertrycke in various strains of mice, R. G. SCHOTT (*Genetics, 17 (1932), No. 2, pp. 203–229, figs. 5*).—An account is given of the resistance of several strains of mice to measured doses of *S. aertrycke*, in which it is shown that the strains differed in the mortality resulting from similar doses and that the mortality within the same strain varied with the size of the dose given. In this work the number of organisms per dose varied from 10,000 to 10,000,000. The animals were inoculated intraperitoneally at about 60 days of age, and mortality was determined over a period of 21 days. The standard dose used for selection was 50,000 bacteria, as this permitted a survival in the different strains varying from 0 to 19.6 per cent.

By breeding from the survivors of the standard dose, the mortality was successfully decreased through six generations from 82.3 to 24.7 per cent with the greatest effect being shown in the first and second selected generations. The hybrids from a strain showing 100 per cent mortality and another strain showing 82.3 per cent mortality gave a mortality similar to that of the more resistant parent. Other tests also indicated that the more resistant strain carried dominant genetic factors for resistance.

The rigid control and the abundance of checks made it improbable that passive immunity played any important part in the findings. It appeared that neither age, weight, nor sex influenced the mortality or the number of days before death in comparable groups receiving the standard dose.

The amount of inbreeding in the selected generations did not show a direct relationship to the resistance or susceptibility to the disease. Certain individuals, although resistant, seemed to contribute little to their progeny in the way of resistance, showing the importance of considering the history of resistance in ancestors and offspring or, in other words, the genotype for resistance.

The anterior lobe and menstruation, C. G. HARTMAN, W. M. FIROR, and E. M. K. GEILING (*Amer. Jour. Physiol., 95 (1930), No. 3, pp. 662–669*).—In these studies a definite hormone of the anterior lobe of the hypophysis seemed to be responsible for menstruation in monkeys.

Observations on a cyclic variation in the capacity of the anterior hypophysis to induce ovulation in the rabbit, J. M. WOLFE (*Amer. Jour. Anat., 48 (1931), No. 2, pp. 391–419*).—In preliminary experiments it was found that ovulation in the rabbit could be induced with marked regularity by implantations or subcutaneous injections of the anterior lobe of the hypophysis from pregnant sows or intravenous injections of urine from pregnant women. Much variation was found in the amount of anterior lobe from different sows necessary to induce ovulation. This was related to the stage of the oestrous cycle in which the sow happened to be. One mg of anterior lobe tissue removed from sows just before oestrum, macerated in salt solution, and injected intravenously induced ovluation in sexually mature rabbits. Ten mg of the anterior lobe were required when the donors were in heat, and 40 mg were required to induce ovulation when the donors contained active corpora lutea.

The regulation of the hypophysis by the testicle, and some problems of sexual dynamics, T. MARTINS and A. ROCHA (*Endocrinology, 15 (1931), No. 5, pp. 421–434, figs. 16*).—Studies on parabiotic rats showed that a precocious sexual maturity was induced when an infantile female was united with a castrated

infantile male or female on account of the hyperactivity of the hypophysis of the castrated animal. Testicular administration prevented the hyperactivity of the hypophysis, but did not prevent atrophy of the genitalia.

The pituitary-gonadal relationship and the problem of precocious sexual maturity, E. T. ENGLE (*Endocrinology, 15 (1931), No. 5, pp. 405–420, fig. 1*).—In this study 63 female rats ranging in age from 17 to 20 days were given 3 daily implants of the anterior lobe of the pituitary within 4 days. In all cases the rupture of the vaginal plate occurred on the third or fourth day. An opportunity for mating was afforded, and the ovaries of 30 which mated at the first induced oestrum were examined within 5 days of mating. Mating occurred in 20 of the females on the day of rupture of the vaginal orifice or on the following day, and in all by the sixth day after rupture. On autopsy it was found that 11 of these females had ovulated. The first normal oestrum and mating of the treated animals was somewhat delayed as compared with the controls. The average age at the first normal oestrum for the controls was 33.7 days and for the test animals 43.8 days, and the average age at first mating was 40.5 for the controls and 45.8 days for the treated animals.

On the question of the energy of spermatozoa motility [trans. title], E. E. IWANOW (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 20 (1931), No. 3, pp. 404–418, fig. 1*).—The oxygen used by measured quantities of dog spermatozoa at different temperatures are reported. It was found that motility of the spermatozoa continued for more than an hour under anaerobic conditions.

***Studies on the uterus*, V, VI**, S. R. M. REYNOLDS (*Amer. Jour. Physiol., 97 (1931), No. 4, pp. 706–721, fig. 1; 98 (1931), No. 2, pp. 230–236, fig. 1*).—This series (E. S. R., 64, p. 729) is continued.

V. *The influence of the ovary on the motility of the nongravid uterus of the unanesthetized rabbit.*—It was found that uterine activity in the nonpregnant animal was associated with ovarian activity, and that uterine activity could be restored in castrated rabbits by theelin and estrogen administration.

VI. *The effect of oestrin on the uterine fistula during pseudopregnancy.*—Female rabbits were injected at different intervals following sterile coitus with theelin, a preparation of oestrin, and the motility of the uterus studied. Injection of small amounts of theelin immediately after coitus tended to overcome the cessation of motility usually occurring, but when the administration of theelin did not begin until after the fourth day of pseudopregnancy it was impossible by subcutaneous, intravenous, or both methods of injection of large amounts of theelin to bring about the return to normal activity. Uterine activity was restored on the third day in only one of five animals following mating.

The reproductive processes of certain mammals.—II, The size of the Graafian follicle at ovulation, A. S. PARKES (*Roy. Soc. [London], Proc., Ser. B, 109 (1931), No. B 761, pp. 185–196, figs. 6*).—In continuing this series (E. S. R., 66, p. 818), the size of the Graafian follicle and ovum in the mouse, rat, ferret, rabbit, baboon, pig, and cow at different stages of growth is reported with reference to the size of the adult animal. The diameter of the ripe follicle plotted on double logarithmic paper against the weight of the species was found to closely approximate a straight line. The ratio of the size of the follicle when the ovum is fully grown to the size of the mature follicle decreases considerably in the larger mammals.

The functions of the corpus luteum.—V, Changes in the sterile horn during pregnancy, and their relation to changes in the corpus luteum, R. DEANESLY and A. S. PARKES (*Roy. Soc. [London], Proc., Ser. B, 109 (1931), No. B 761, pp. 196–215, pls. 3*).—In continuing this series (E. S. R., 65, p. 80),

the sterile horn of the uterus of rabbits and mice during the first half of pregnancy was found to undergo pregestational changes. During the second half of pregnancy the epithelium disintegrates in the rabbit but continues development in the mouse with distention of the uterine glands up until parturition. The sterile uterine horn in the rat showed practically no development, and only a little development was observed in the guinea pig during pregnancy.

The relationship between the thymus and reproduction, D. H. ANDERSEN (*Physiol. Rev., 12 (1932), No. 1, pp. 1–22*).—The relationship of the thymus to sexual maturity is discussed with special reference to experiments with rats. The results were largely negative, although it was found that the thymus gland increased in size until the time of puberty and involution began thereafter.

Studies on the urinary excretion of oestrin, with especial reference to the effect of the luteinizing hormone and progestin, G. VAN S. and O. W. SMITH (*Amer. Jour. Physiol., 98 (1931), No. 4, pp. 578–584*).—Evidence is presented from humans and rabbits to show that the urinary excretion of oestrin is related to the activity of the luteinizing hormone and progestin.

The effects of simultaneous injections of the female and male hormones in capons, M. JUHN, F. D'AMOUR, and E. B. WOMACK (*Amer. Jour. Physiol., 95 (1930), No. 3, pp. 641–649, figs. 5*).—The combined injection of male and female hormones into capons caused the development of male head furnishings and female plumage. Mixing the hormones for 24 and 48 hours before injection did not alter the reaction, but when the hormones were administered separately on alternate days the head furnishings were only slightly influenced and the female plumage did not develop.

Studies on the physiology of reproduction in birds, XXVIII, XXIX, XXX (*Amer. Jour. Physiol., 97 (1931), Nos. 2, pp. 343–352; 4, pp. 581–587, fig. 1; 617–625, figs. 5*).—Three studies are reported in continuing this series (E. S. R., 64, p. 730).

XXVIII. *Extirpation of thymus and bursa in pigeons with a consideration of the failure of thymectomy to reveal thymus function,* O. Riddle and J. Křížecký.—As was previously found for the bursa Fabricii (E. S. R., 62, p. 825), the removal of both the thymus and bursa in 17 common pigeons had no influence on the development of the reproductive organs or on reproduction. It is suggested that other tissues have a thymic function, especially the lymphoid organs.

XXIX. *Season of origin as a determiner of age at which birds become sexually mature,* O. Riddle.—From a study of the relation of the age of attaining sexual maturity and the month in which the egg was laid in 316 common pigeons and 404 ring doves, it was found that the birds from eggs laid from September to January matured most rapidly while those from eggs laid from February to August required a considerably longer time for reaching sexual maturity. Thyroid and possibly pituitary activity was associated with normal sexual maturity, which usually occurs from February to July.

XXX. *Control of the special secretion of the crop-gland in pigeons by an anterior pituitary hormone,* O. Riddle and P. F. Braucher.—In these studies it was found possible, by the administration of preparations from the anterior lobe of the pituitary (containing the sex maturity hormone and probably the growth promoting hormone) to cause proliferation and full development of the crop gland in 29 young doves and pigeons, while the controls or birds receiving the luteinizing hormone from pregnant urine or posterior lobe preparations did not show the development. The response in the crop gland also occurred after denervation in the area. The effects on the crop gland were clear in 72 hours after administration of the hormone.

Chick mortality and sex-ratio in the domestic fowl, W. and A. B. LANDAUER (*Amer. Nat., 65 (1931), No. 701, pp. 492–501*).—The percentage of males among the crossbred and White Leghorn chicks dying during the first two months of life at the Connecticut Storrs Experiment Station was found to range from 53.3 during the first week to 53.7 from the fifth week to the end of the second month, showing a somewhat higher mortality of males than females notwithstanding the slight excess of females at hatching.

A study of the gestation period of Holstein-Friesian cows, J. C. KNOTT (*Jour. Dairy Sci., 15 (1932), No. 2, pp. 87–98, fig. 1*).—A study at the Washington Experiment Station of the length of 2,824 gestation periods of the cows in several herds indicated that the average duration in single births was 279.9 ± 0.063 days. The shortest period was 262 days and the longest period 296 days. The gestation periods for males were about 1 day longer than those for females. There was also indication of a slight increase in the length of the gestation period, with increases in the age of the dams from 2 to 6 years. In 86 twin births the gestation periods for male pairs averaged 276.5 ± 0.687 days, female pairs 273.9 ± 0.762 days, and for male and female pairs 275.8 ± 0.491 days. There was some variation in the gestation periods of calves sired by different bulls and produced by the same cows. A comparison of the gestation periods of cows and their calves indicated a tendency for the calves to have gestation periods similar in length to those of their dams.

FIELD CROPS

[Crops experiments at the North Louisiana Substation, Calhoun, in 1931], S. STEWART (*Louisiana Stas., North Louisiana Sta. Rpt. 1931, pp. 6–18, 20–25, 27, 28*).—The progress of experiments with field crops is reviewed as heretofore (E. S. R., 63, p. 130) for variety trials with cotton and corn; fertilizer tests, especially as to nitrogen and potash carriers, and cultural (including planting) tests with cotton, corn, and oats; comparisons of winter cover crops for cotton and corn; pasture studies; and manured rotations. Results of variety trials with oats, soybeans, grain sorghum, and sorgo, and a time of planting test with oats are reported by J. P. Gray.

Recommended varieties of field crops for New Jersey, H. B. SPRAGUE (*New Jersey Stas. Circ. 257 (1932), pp. 15*).—Varieties and strains of corn for grain and for fodder or silage, winter wheat and rye, oats, barley, alfalfa, red clover, soybeans for hay, and timothy are recommended from the results of extensive tests for the northern, central, and southern parts of New Jersey. Brief descriptions are included.

[Crops experiments at Rothamsted, 1929 and 1930] (*Rothamsted Expt. Sta., Harpenden, Rpts. 1929, pp. 23–38, 45–49, 78–81, 84–105, 115–124; 1930, pp. 21–38, 42–51, 119–149, 155–171*).—Investigations with field crops at the station and on outlying fields, reviewed again (E. S. R., 63, p. 332), comprised fertilizer experiments with wheat, barley, oats, potatoes, sugar beets, mangels, and hay; effects of fertilizers on the malting value of barley; cultural tests with barley and mangels; the effect of fallowing on grain production; the relation of weather to yields of wheat and barley; fertilized crop rotations; trials of forage mixtures; inoculation studies with alfalfa; estimation of losses due to weeds; and studies of the accuracy of field experiments.

[The Woburn field experiments, 1929 and 1930], J. A. VOELCKER (*Rothamsted Expt. Sta., Harpenden, Rpts. 1929, pp. 68–76, 106–114; 1930, pp. 97–108, 150–154*).—The yields in the fifty-third and fifty-fourth years of continuous wheat and barley on Stackyard field treated with various fertilizer materials and manure, the culture being resumed after two years of fallow

(1927 and 1928), are tabulated and discussed as in earlier reports (E. S. R., 58, p. 224; 63 p. 332). Other experiments reported on were crop rotations, green manuring tests, and fertilizer trials with barley, potatoes, sugar beets, and grassland. The Woburn farm and its operations are described by H. G. Miller.

Summer fallow at Ardmore, S. Dak., O. R. Mathews and V. I. Clark (*U. S. Dept. Agr. Circ. 213 (1932), pp. 15*).—Experiments comparing summer fallow with other methods of crop production, extending from 1913 to 1930, inclusive, furnished results applicable chiefly to western South Dakota, eastern Wyoming, and northwestern Nebraska.

Summer fallow is considered of major importance in the storage of moisture and is cultivated primarily for weed control. After plowing the land, three or four cultivations with duck foot cultivator have sufficed to maintain the fallow for a year. The fallow prepared by spring plowing returned slightly higher yields and needed less cultivation to suppress weeds than that prepared by fall plowing. The water stored in fallowed land averaged 5.25 in., or 20.5 per cent of the total precipitation, which averaged 25.62 in. over 11 fallow periods.

Summer fallow tended to eliminate crop failure and to equalize production between years. Spring wheat and winter wheat, respectively, produced 74 and 109 per cent more on fallow and 46 and 48 per cent more on disked corn land than on land continuously in wheat. Spring wheat usually outyielded winter wheat. In their relative yields on fallow and other preparations oats and barley resembled spring wheat. Barley materially outyielded wheat and oats and was largely replacing corn in the area. Compared with continuous cropping corn on fallow produced only 35 per cent more, and sorgo showed little response to fallow. Fallowing as a preparation for corn did not appear justified. The yields of small grain following corn were relatively good, and corn was a valuable crop in the rotation, especially on farms having livestock.

[Range research] (*Ecology, 11 (1930), No. 4, pp. 734–782, figs. 6*).—Papers presented at the symposium on range ecology held at Ames, Iowa, on January 1, 1930, included Comparison of Methods of Quadratting, by H. C. Hanson and L. D. Love (pp. 734–748); Combination of List and Chart Quadrat Methods for Grazing Studies, by H. E. Malmsten (pp. 749–751); Methods of Determining Forage Preferences of Stock, by V. L. Cory (pp. 760–763) (E. S. R., 65, p. 856); Methods of studying Shrubby Plants in Relation to grazing by E. W. Nelson (pp. 764–769); The Study of Big Game Ranges, by S. B. Locke (p. 770); The Value of Physical Factor Measurements in Range Research, by W. G. McGinnies (pp. 771–776); Application of Agronomic Methods in Range Research, by J. T. Sarvis (pp. 777–782); and the paper by Aldous noted below.

Effect of different clipping treatments on the yield and vigor of prairie grass vegetation, A. E. Aldous (*Ecology, 11 (1930), No. 4, pp. 752–759*).—Bluestem pastures were clipped at several different intervals and at several different heights in studies at the Kansas Experiment Station.

The yield of vegetation varied inversely with frequency of cutting, being least on plats clipped every 2 weeks throughout the season and highest where clipped once at maturity. In density the vegetation decreased about 60 per cent on plats clipped at 2-week intervals for three seasons and by about 13 per cent on areas clipped at 3-week intervals. Vegetation on areas clipped every 2 weeks deteriorated in composition to the point where they contained about 50 per cent of annuals practically worthless for feed, whereas plats clipped at longer intervals changed very little from their original composition. The protein content was highest on plats clipped most often, but this would not suffice to compensate for the decreased yield and injury to vegetation. See also previous notes (E. S. R., 63, p. 729; 64, p. 827).

The forage grasses of the Belgian Congo and improvement of natural pastures [trans. title], W. ROBYNS (*Bul. Agr. Congo Belge, 21* (*1930*), *No. 4, pp. 1376–1394 figs. 8*).—The native grasses making up the pastures, largely savannah, in different situations are indicated, the nutritive values and chemical composition of the principal sorts are tabulated, and methods of improving pasturage are outlined briefly.

Further observations on the nitrogenous manuring of grassland, H. W. GARDNER, J. HUNTER-SMITH, and H. R. WILLIAMS (*Jour. Agr. Sci.* [*England*], *21,* (*1931*), *No. 4, pp. 780–798*).—Additional results in the experiments (E. S. R., 63, p. 333), with periodic dressings of nitrogenous fertilizers followed by rotational grazing, showed that the rainfall was the dominating factor in total yield. Increased grazing due to nitrogenous fertilizer (three dressings per year each of 1 cwt. ammonium sulfate per acre) was estimated at between 20 and 30 per cent above the controls. The legume species were suppressed on the nitrogen plats and currently did not exceed one-fifth of those on the controls. The system caused an increase of sheep's fescue and a decrease in meadow grasses and Yorkshire fog, while ryegrass was either maintained or increased considerably. The increase in protein percentages caused by nitrogen averaged 2.39 per cent in the dry matter of the grasses, 0.33 per cent in the clovers, and 2.56 per cent in that of the weeds. The 4 years' experience indicated that possibilities of increased production by application of the system to well-managed permanent grassland are limited to about 20 or 30 per cent.

The moisture content of forage at different times in the day, C. J. WILLARD (*Jour. Amer. Soc. Agron., 23* (*1931*), *No. 11, pp. 853–859*).—The principal observations made in this study by the Ohio Experiment Station have been recorded earlier (E. S. R., 64, p. 624).

Studies of prairie hay in north central Nebraska, F. D. KEIM, A. L. FROLIK, and G. W. BEADLE (*Nebraska Sta. Research Bul. 60* (*1932*), *pp. 54, figs. 2*).—The botanical structure and yields of native hay meadows in Holt, Rock, Brown, and Cherry Counties in north central Nebraska, the important prairie hay producing section of the State, were studied during the period 1926–1929. The topography, drainage, and soils of the area are described briefly.

The ground water level lies near the surface in most of the Elkhorn Valley region and many of the sand hill valleys; it comes nearest to the surface from March to May and gradually lowers during the summer, reaching its lowest level from September to November, after which it rises gradually. Its annual variation is within a range of about 3 ft. An intricate relationship was observed to exist between the depth of the ground water level and the botanical structure of the native vegetation. The data presented show changes in vegetative structure and yield in a number of meadows, including numerous stages in succession beginning with the hydric reed canary grass-smartweed associes and ending in the xeric needle grass-grama grass community.

With respect to the production of prairie hay, natural plant communities are divided into wet areas, slough grass type; bluestem areas, big bluestem-Indian grass type; drier areas of the bluestems, Indian grass-little bluestem type; transitional areas between the bluestem type and the typical successional vegetation of the sand hills including the needle grass-grama grass climax vegetation; and typical successional vegetation of the sand hills. The botanical structure and yields are given for a number of meadows representing each type.

Several cultivated forage plants can be grown successfully in the native meadows but only under subirrigation conditions. Red clover, alsike clover, and sweetclover sown into the subirrigated native meadows markedly increased the yields and crude protein content of the hay. However, sweetclover should be used rarely, since its hay is undesirable in quality during the

second year of growth unless cut unusually early. White clover is not recommended for the meadows because it does not benefit yields much and it is hard to cut, but because of its stoloniferous habit it may be used profitably in subirrigated pastures. Timothy and redtop increased yields and were good supplements to introduced legumes. Kentucky bluegrass did not affect yields appreciably, and it lowered the quality of hay, especially when harvesting was delayed until after the bluegrass had seeded. Indications were that native meadows containing cultivated forage plants should be harvested late enough every two or three years to assure reseeding. Cultivated forage plants in a meadow were found to decrease the yield of the native grasses, sedges, rushes, and forbs appreciably.

About twice as much crude protein was found in the cultivated clovers as in the native vegetation in its leafy growth stage, so that the introduction of clovers increases the quantity of crude protein twice as rapidly as it does vegetative yields. Cultivated grasses were found to increase the total crude protein in the hay but not as markedly as the yields, due to the lower protein content of the tame grasses as compared with the native vegetation. Cultivated clovers caused a small but significant increase in the protein content of the native vegetation as a result of associative growth, whereas cultivated grasses gave negative results.

Alfalfa seed, W. Kidder, R. Mercer, and G. E. Lewis (*Mont. Agr. Col. Ext. Bul. 111 (1931), pp. 23, figs. 15*).—Practical information is presented on producing alfalfa for seed and feed on dry land in Montana.

Growing alfalfa-seed, J. W. Carlson (*Utah Sta. Circ. 97 (1932), pp. 20, figs. 7*).—Cultural methods, irrigation, harvesting, and management practices, and varieties, based extensively on research noted earlier (E. S. R., 65, p. 432), are recommended for the growing of alfalfa for the seed crop.

Quality of alfalfa seed sold in Colorado, 1930–1931, A. M. Lute (*Colorado Sta. Bul. 389 (1932), pp. 29*).—Tables show the purity, germination, and content of weed and hard seeds for 329 samples of alfalfa seed collected from dealers in Colorado in 1930 and 1931. In 1930 72 per cent of the samples contained sweetclover and in 1931 77 per cent. The number of weeds per pound varied from 0 to 153,810 in 1930 and from 90 to 26,100 in 1931.

Growth of bluegrass with various defoliations and abundant nitrogen supply, L. F. Graber and H. W. Ream (*Jour. Amer. Soc. Agron., 23 (1931), No. 11, pp. 938–944, figs. 2*).—Some of the quantitative responses of top and underground growth of bluegrass, during and after defoliations varied in height and frequency of removal, were determined at the Wisconsin Experiment Station on pot cultures receiving heavy nitrogenous fertilization and unfertilized.

The heavy application of nitrogen only stimulated abundant vegetative growth when the defoliations permitted accumulations of carbohydrate reserves. Thus when frequent and close precuts were followed by eight close aftercuts the surplus of organic foods was at a very low level, and a negative response occurred with fertilization. However, with less drastic precuts the food reserves sufficed to give a moderate and positive response to fertilization. With a single aftercut the plants accumulated carbohydrates, and fertilization greatly increased top growth. Frequency and height of defoliations decidedly affected underground development, whereas abundant nitrogen did not influence root and rhizome growth materially. With the accumulation of organic foods resulting from a single aftercut at the end of 123 days of growth after the precuts, a pronounced increase occurred in both unfertilized and fertilized cultures when compared with those defoliated eight times during the same period of growth.

Field tests of imported red-clover seed, A. J. Pieters and R. L. Morgan (*U. S. Dept. Agr. Circ. 210 (1932), pp. 24, figs. 3*).—Comparative field tests of seed of red clover imported from several foreign countries and of domestic seed were made in cooperation with the experiment stations in 16 States over the period 1922–1929. Foreign clovers usually proved unsatisfactory for use in the Eastern United States. The instances in which they have outyielded domestic clovers commonly depend on unusually favorable conditions, as mild winters or abundant snow cover. It is pointed out that foreign clovers surviving the winters successfully may give a fair to good first cutting, but the second crop is nearly always inferior and is often too poor to cut. Foreign clovers often die out just after the first cutting. Differences in the quality of domestic red clover seeds also are indicated. See also a previous note (E. S. R., 66, p. 231).

The adaptation of corn to upland and bottom land soils, T. H. Goodding and T. A. Kiesselbach (*Jour. Amer. Soc. Agron., 23 (1931), No. 11, pp. 928–937*).—When commercial varieties of corn native to upland and bottom land soils, respectively, within given localities in eastern Nebraska were grown in comparison during seven years at the Nebraska Experiment Station, no material heritable differences were noted in vegetative characteristics or grain yield in relation to these conditions. This is in agreement with the results of Williams and Welton (E. S. R., 33, p. 35).

Corn varieties for grain, fodder, and silage, H. B. Sprague, N. F. Farris, W. G. Colby, and N. Curtis (*New Jersey Stas. Bul. 537 (1932), pp. 46, figs. 15*).—The status of and soil and climatic conditions affecting corn growing in New Jersey are described, together with reports of the behavior of corn varieties in comparative tests in 1928, 1929, and 1930 at the station and in Warren and Gloucester Counties. The importance of growing high yielding adapted varieties was demonstrated. Varieties recommended from the tests variously for grain, fodder, or silage in northern, central, and southern New Jersey and described briefly include Somerset Leaming, Mercer White Cap, Lancaster Surecrop, Hulsart Yellow Dent, and Reid Yellow Dent (Croshaw). Preliminary information also is given on varieties for corn borer conditions.

Cotton variety tests, 1931, H. K. Brabham (*Georgia Sta. Circ. 100 (1932), pp. 8*).—Variety tests with cotton at the station and near Yatesville in the Piedmont, at Rome in the mountains, and at Fort Valley, Carnegie, and Waynesboro in the Coastal Plain are reported on for 1931. Among the leaders when ranked in acre value were D. & P. L. No. 8, Half-and-Half, Deltatype 9. Missdell 1, Cleveland 884, and the wilt resistants Lightning Express, Rhyne-Cook, and Clevewilt.

Cotton improvement through type selection, with special reference to the Acala variety, O. F. Cook (*U. S. Dept. Agr., Tech. Bul. 302 (1932), pp. 65, pls. 26*).—The general problems of selection in cotton are reviewed, and the mass, individual, progeny, and type systems of selection are defined, illustrated, and compared. Type selection, a new method considered in some detail, especially in regard to Acala cotton, is essentially a process in which the choice of individuals to furnish seed for progeny plantings is limited to a single type of plant, so that the progeny blocks are made as uniform as possible, to the limit of the breeder's ability to avoid deviations from the type. Also any variant individuals that can be detected are removed from progeny blocks and increase fields as a means of maintaining the uniformity of the stock. Variations in cotton underlying the application of selection are described, with pertinent remarks on field conditions and precautions to be observed in selection.

Irrigation and related cultural practices with cotton in the Salt River Valley of Arizona, S. H. HASTINGS (*U. S. Dept. Agr. Circ. 200 (1932), pp. 32, figs. 11*).—An informative discussion on the irrigation needs of cotton and methods of applying the water and associated cultural methods and field practices for the crop in the Salt River Valley is presented, with comments on climatic and agricultural conditions in the region, the reaction of the plant to unfavorable growth conditions, the accumulation of salts from continued irrigation and its control by leaching, alfalfa as an aid to irrigation of cotton, and the relation of soil moisture conditions to shedding and the crazy top disorder.

Spacing in relation to the development of the flax plant, K. H. KLAGES (*Jour. Amer. Soc. Agron., 24 (1932), No. 1, pp. 1–17, figs. 12*).—The seed flaxes North Dakota Resistant No. 114 with small seeds and Bison flax with large seeds were grown at the South Dakota Experiment Station in 6-in. drill rows at intervals ranging from unthinned plants, 21 to 22 per foot of drill row, to 1.5, 3, 6, 9, 12, and 15 in. between plants.

With the wider spacings came decreased seed yields per plat, taller plants (up to 1.5-in. spacing), more stems, more secondary branches per plant (up to 6-in. spacing), and more bolls per plant, and increased weight and seed yield per plant. The number and weight of seeds per boll and the oil content of the seed were not affected much by differences in spacing. The relatively high yields of flax on the closely spaced plats were held due to the ability of the plants to produce at the close spacings a greater number of bolls per unit of area than at the greater distances, while the number of seeds per boll and the weight per seed remained practically constant. Correlation coefficients for various combinations of the characters studied are tabulated and discussed.

Registration of varieties and strains of oats, V, T. R. STANTON (*Jour. Amer. Soc. Agron., 23 (1931), No. 12, pp. 1013–1017*).—New varieties of oats approved for registration (E. S. R., 62, p. 521) and described with records of their performances included Columbia, an early gray oats, and Franklin, an early red sort, both selections from Fulghum.

Proso or hog millet, J. F. BRANDON, A. KEZER, J. J. CURTIS, and D. W. ROBERTSON (*Colorado Sta. Bul. 383 (1932), pp. 12, figs. 5*).—Cultural directions are given for the production of proso, largely from experiments since 1902 at the Akron, Colo., Field Station in cooperation with the U. S. Department of Agriculture. Turghai, an open panicled type with red or yellowish-brown grain led the varieties with an average acre yield of 24.6 bu. for a 13-year period, including two complete crop failures. Turghai on small grain stubble worked early and kept free from weeds up to planting averaged 16.8 bu. over seven years v. 23.5 bu. on fallow. Proso on stubble returned good yields in good seasons but considerably below fallow in unfavorable years.

Agronomic trials with reed canary grass, F. S. WILKINS and H. D. HUGHES (*Jour. Amer. Soc. Agron., 24 (1932), No. 1, pp. 18–28*).—Experiments by the Iowa Experiment Station showed reed canary grass during the period 1925–1928 to average 2.06 tons of hay per acre compared with smooth brome 1.45, timothy 1.44, tall meadow oatgrass 1.39, redtop 1.18, meadow fescue 0.98, and orchard grass 0.83 tons. It was eradicated as easily as any of the others and was more drought resistant in 1927. In the dry year 1930 it demonstrated this character still further.

Horses consumed reed canary grass hay harvested 10 days after the seed was ripe in preference to timothy of good quality. In pasture trials cows found reed canary equal in palatability to six other grasses, including Kentucky blue-

grass; Canada bluegrass, smooth brome, and timothy were superior, and orchard grass and fescue grasses were inferior.

When seedings of reed canary grass on upland soil in mixtures with other grasses, including Kentucky bluegrass, were cut close and often an increase in the proportion of bluegrass resulted, but this did not occur when cuttings were less frequent. Reed canary grass maintained itself satisfactorily in established Kentucky bluegrass pasture on moist bottom soil but not on upland soil. Delay of harvest until about 5 per cent of the seed had shattered resulted in the largest yield and the best quality of seed. When seed crops were harvested with a grain binder, the use of burlap sacks as shock covers prevented loss from shattering and did not lower the quality of seed.

Rice: Culture, industry, uses, and trade [trans. title] (*Rev. Agr., Com. y Trab. [Cuba], 13 (1932), Spec. No., Feb., pp. 128, figs. 44*).—Designed to stimulate rice production in Cuba, this special number contains many short articles variously concerned with the commercial and economic phases of the industry, rice as food, its botanical characters and relations, soils, cultural and field methods, irrigation, harvesting, and marketing practices for rice, and the control of insect pests and rice diseases.

The grain-shedding character in rice plants and its importance, S. G. Bhalerao (*Imp. Inst. Agr. Research, Pusa, Bul. 205 (1930), pp. 36, pls. 9, fig. 1*).—The shattering of grain in the rice of Bombay Presidency before ready for harvest, aside from environmental causes, occurs more in some varieties than in others. The coherence of the grain to its pedicel is more superficial in the shedding types than in nonshedding types. The damage due to this cause varies from 3 to 30 per cent of the crop, according to the care of the seed and the field, and extends even to succeeding crops through the self-sown seeds. Grain shedding is especially pronounced in the wild rice (*Oryza sativa*), which occasionally enters cultivated fields in the neighborhood of its wild habitat. The trouble is held to be aggravated by hybridization of the wild rice with cultivated varieties. The characteristics of wild rice and of shedding and nonshedding types of cultivated strains are described in some detail. Remedial measures include control of infestation through the soil, the water, and the seed.

Sudan grass for summer pasture, L. R. Neel (*Tennessee Sta. Circ. 44 (1932), pp. 4*).—Success with Sudan grass as summer pasture for milk cows, beef cattle, and hogs is reported from experiments at the Middle Tennessee Substation. Brief directions are given for growing and pasturing the crop.

Improvement of sugar cane varieties, A. J. Koens (*Internatl. Rev. Agr., Mo. Bul. Agr. Sci. and Pract. [Rome], 21 (1930), Nos. 4, pp. 129–134; 5, pp. 167–175*).—The current status of varietal improvement in sugarcane in important producing countries is reviewed, and a bibliography of some scope is appended.

Varietal mixture in commercial wheat and its effect on milling and baking quality, J. B. Harrington et al. (*Sci. Agr., 12 (1932), No. 5, pp. 262–280*).—A cooperative investigation made to determine for Manitoba and Saskatchewan the amount and kind of mixing of wheat varieties taking place at the farm before and after sowing and at country, terminal, and transfer and ocean port elevators demonstrated that the wheat of the two provinces, on a quality basis, is desirably high in purity at all stages and that nearly all of the mixing that occurs takes place on the farm, the critical place of mixing being in the field and during threshing. Milling, baking, and blending studies showed that admixtures of varieties of other groups with Marquis produced very little, if any, effect; this might be attributed chiefly to the fact that all of the samples were high in protein.

Registration of improved wheat varieties, V, VI, J. A. CLARK (*Jour. Amer. Soc. Agron., 22 (1930), No. 12, pp. 1041, 1042; 23 (1931), No. 12, pp. 1010–1012*).—The Iofurk, Iowin, Gasta, Cheyenne, and Komar varieties of wheat, approved for registration (E. S. R., 62, p. 523), are described, with records of their performances.

The climate of wheat in the world, G. AZZI (*Le Climat du Blé dans le Monde. Rome: Inst. Internatl. Agr., 1930, pp. XIII+1165, pls. 10, figs. 34*).—This volume resembles in scope the work noted earlier (E. S. R., 60, p. 136).

Ammonium thiocyanate as a weed eradicant, R. B. HARVEY (*Jour. Amer. Soc. Agron., 23 (1931), No. 11, pp. 944–946*).—Ammonium thiocyanate, applied either as dry crystals or in water solution as a spray, was found to be toxic to a number of weed pests, in tests at the Minnesota Experiment Station. A solution of 1 to 5 lbs. per gallon of water killed the leaves of thistles, burdock, quack grass, poison ivy, prickly-ash, scrub oak, and nettles, and if the leaves were well covered the salt was washed off into the soil and killed the whole plant. Dry ammonium thiocyanate can be sprinkled around the base of the shrub or plant, adjusting the size of dose to the size of plant. The merits of the chemical include a comparatively short period of toxicity to crops and a possible fertilizer value. The crude thiocyanate liquor from gas plants is considered a good eradicant for bunkers of golf courses and for driveways, and in this use seems more desirable than combinations of sodium chlorate and calcium chloride.

HORTICULTURE

[Horticulture at the Fruit and Truck Experiment Station], B. SZYMONIAK (*Louisiana Stas., Fruit and Truck Sta. Rpt. 1931, pp. 5–14, 20–24, 25–33*).—Data are presented on the results of fertilizer, propagation, variety, and cultural tests with strawberries; on cultural and variety tests with muscadine grapes, pecans, and miscellaneous tree fruits; on fertilizer tests with the Satsuma orange; on fertilizer and variety tests with snap beans and cucumbers; and on fertilizer tests with sweet peppers, sweetpotatoes, potatoes, and cabbage.

Horticulture upon various moor soils, A. J. WERTH (*Der Gartenbau auf den Verschiedenen Moorarten. Berlin: Paul Parey, 1931, pp. 107, figs. 34*).—A general discussion on methods of culture, varieties found satisfactory, etc.

The quality of vegetable seeds on sale in New York in 1931, M. T. MUNN, O. H. SIPPLE, and M. E. WOODBRIDGE (*New York State Sta. Bul. 608 (1932), pp. 32*).—Along the lines of earlier reports (E. S. R., 64, p. 739), the results are herein presented of examinations, analyses, and tests upon 773 samples of packet and bulk vegetable seeds purchased in the open markets of the State during the planting season of 1931. Unit utility values "obtained by multiplying the weight in grams of the contents of the parcel by the percentage of germination and dividing by the price in cents" are included in the tabulations.

Field tests of beans, beets, carrots, parsnips, and salsify showed that approximately two-thirds of the seed sold in sealed packets were satisfactory for planting, with the remaining third somewhat questionable. As a rule the product of any single seed firm was quite uniform with respect to quality.

A contribution to the knowledge of the cultivated Alliums of China and Japan [trans. title], ÎA. I. PROKHANOV (Y. PROKHANOV) (*Trudy Prikl. Bot., Genet. i Selek. (Bul. Appl. Bot., Genet. and Plant-Breeding), 24 (1930), No. 2, pp. 123–188, figs. 18; Eng. abs., pp. 184–188*).—This is a discussion of the origin and distribution of various species of Allium.

Freezing point depressions of asparagus shoots determined by a thermoelectric method, E. L FERNALD (*Contrib. Boyce Thompson Inst., 3 (1931), No. 4, pp. 483–498, figs. 3*).—Freezing point depression readings by the thermoelectric method on sections of young shoots of vigorous Washington asparagus plants showed considerable variation with respect to the position on the shoot. In all shoots there was a tendency for values to increase near the crown and roots and also to a lesser extent near the soil surface. The distribution of the high points varied somewhat with the stage of development of the shoot. The greater freezing point depression at certain positions is believed to be associated with the presence of soluble substances involved in growth.

Standard descriptions of vegetables: Beans, T. F. RITCHIE (*Canada Dept. Agr. Bul. 153, n. ser. (1931), pp. 67, pls. 2, figs. 25*).—Accompanied by photographic reproductions, descriptions are given of the plant, flowers, and seeds of important varieties of garden beans, with the purpose of aiding in the standardization of varieties.

The cultivation of cauliflower for seeds [trans. title], P. V. KISLĬAKOV (P. A. KISSLYAKOV) (*Trudy Prikl. Bot., Genet. i Selek. (Bul. Appl. Bot., Genet. and Plant-Breeding), 24 (1930), No. 2, pp. 205–234, figs. 12; Eng. abs., p. 234*).—Summarizing the results of studies with varieties of cauliflower and broccoli, the author states that eastern Transcaucasia has proved a very satisfactory region for producing cauliflower seed.

Anatomy of the primary axis of Solanum melongena, A. F. THIEL (*Bot. Gaz., 92 (1931), No. 4, pp. 407–419, figs. 10*).—The results are presented of a study at the University of Chicago upon the anatomical structure of the primary axis of the eggplant, variety Black Beauty. Instead of two primary xylem groups following different curves, as reported by Artschwager for the potato (E. S. R., 39, p. 629), the author found a bifurcation of the metaxylem.

Effect of seasonal temperatures on chemical composition of kale (Brassica oleracea var. acephala), R. L. CAROLUS (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 502–508, figs. 3*).—Studies at the Virginia Truck Experiment Station of the changes occurring in the composition of leaves of kale plants seeded during early August and harvested at weekly intervals from October 13 to December 8 showed a very rapid increase in the percentage of sucrose in blades, petioles, and stems, with the first marked decline in temperature in late October. Following a week of relatively high temperature in November the sucrose content declined temporarily. The temperatures most highly correlated with results were the averages of the mean of the minimum and maximum temperatures for the three days preceding sampling. Variations in dry weight showed a high degree of negative correlation with the temperature index used, the highest percentage of dry matter being recorded on October 27 after a week of low mean temperature in which the maximum did not reach 16° C. (60.8° F.) Nitrogen varied to such an extent that its content could not be definitely correlated with temperatures. Since the leaf blade makes up the bulk of the kale plant, conditions which caused a decline in sugar in the blades, although resulting in gains in other parts of the plant, affected adversely the edible quality.

The peas of Ethiopia (Abyssinia): A contribution to the problem of the origin of cultivated peas.—Essay II [trans. title], L. I. GOVOROV (*Trudy Prikl. Bot., Genet. i Selek. (Bul. Appl. Bot., Genet. and Plant-Breeding), 24 (1930), No. 2, pp. 399–431, figs. 9; Eng. abs., pp. 420–431*).—A discussion of the origin of cultivated peas.

Some effects of different nutrient solutions on the structure, composition, and quality of peas, C. B. SAYRE and B. R. NEBEL (*Amer. Soc. Hort.*

Sci. Proc., 27 (1930), pp. 221–226, pls. 4).—Cytological studies, at the University of California and the New York State Experiment Station, upon Surprise peas harvested in the prime canning stage from plants grown in nutrient solutions differing in their contents of calcium and potassium showed certain well marked differences attributable to the nutrient treatments. Peas from high-calcium cultures had thicker seed coats than those of low-calcium plants, and the thicker seed coats were also tougher. However, in comparing high- and low-potassium cultures, the high-potassium peas had thicker seed coats, but these were not as tough as the thinner ones. The authors suggest that calcium possibly combines with the pectic materials of the middle lamella to increase the toughness of the tissues.

Observations on sections of the stems showed larger amounts of potassium in the parenchymatous layers of the high-potassium plants. The stems of high-calcium plants contained cells with ample protoplasm with plastids in the parenchyma and nuclei in all conductive and vegetative regions, while stems of low-calcium plants contained cells with no visible plasma and only a few undefined nuclei in the parenchymatous region.

Anatomy of the transition region of Pisum sativum, J. H. GOURLEY *(Bot. Gaz., 92 (1931), No. 4, pp. 367–383, figs. 22)*.—Using the Champion of England variety, a study was made at the University of Chicago of the anatomy of the hypocotyl and of at least two internodes of the stem. Exarch bundles were found in the first and second internodes and in a protostelic situation in at least a portion of the first internode. A transition was observed in the region of the cotyledonary node from the triarch arrangement of the root to that of six characteristic vascular bundles in the first internode. After the first leaf trace diverged from the stele at the second node, portions of the lateral exarch bundles were observed to be laid down progressively nearer together until they appeared as one endarch bundle above the leaf gap. At the third internode all bundles were endarch, and the permanent stem structure was accomplished.

Growing of greenhouse tomatoes, I. C. HOFFMAN *(Ohio Sta. Bul. 499 (1932), pp. 28, figs. 5)*.—Early seeding and early transplanting gave favorable results with the early spring crop of greenhouse tomatoes. Plants set in the beds as late as March 1 were late in maturing their fruits and sometimes suffered injury to their top blossom clusters from excessive heat. Plants held in small pots too long became woody and stunted and often failed to set well at the first and second clusters. Potted tomatoes transplanted without disturbing the roots grew faster than those grown in flats, yielded ripe fruits earlier, and produced larger crops. Plants given from 3.5 to 4 sq. ft. were more productive than crowded plants.

Nitrogen applied during the harvesting period increased the size of fruits and of crop and improved quality. Mulches of strawy manure reduced yields unless accompanied by nitrogen fertilizer. Manure spaded into the soil following sterilization restored the beneficial flora.

Leaf pruning reduced yield, with some indication that the removal of lower leaves was beneficial in the late season when the nitrogen supply had been considerably reduced.

The influence of the position of the top bud of the scion upon the stand of grafts, T. SWARBRICK *(Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1930, pp. 46–51)*.—Observations at the Long Ashton Research Station on Bramley Seedling and White Alphington apple scions grafted in two ways on French crab roots, (1) directly in line with the matched cambium in the tongues of the scion and stock and (2) directly over the mismatched tongues, showed that the bud-in-line method is the better of the two positions, both with regard to size

and to uniformity of the resulting trees. This evidence supports the findings of Roberts (E. S. R., 58, p. 138). As concerned the success of grafts, there was no difference between the two methods in the case of White Alphington and 9 per cent better take for the bud-in-line method in Bramley Seedling.

The relation of nitrogen to potassium in the nutrition of fruit trees, E. J. GILDEHAUS (*Bot. Gaz., 92 (1931), No. 4, pp. 384–395*).—Root-pruned 3-year-old Delicious apple trees were grown at the University of Missouri in sand cultures differing in their ratio of nitrogen to potash in order to ascertain the relation of the two elements to the nutrition of fruit trees. At the end of 10 weeks trees with abundant nitrogen but without potash exhibited the initial stages of leaf scorch, manifested in a browning of the apex with sometimes small brown patches appearing along the margins. At the same time noticeable shoot growth had ceased and terminal buds had formed. The injury was deemed a result of potash starvation, since cultures containing an excess of potash and ample nitrogen did not develop the symptoms. When the amount of nitrogen was reduced to one-third that of the complete nutrient solution, the development of leaf scorch was retarded. Decreasing the amount of potash or increasing the amount of nitrogen in the nutrient supply was conducive to leaf scorch. An attempt to correlate carbohydrate content with the nitrogen-potash ratio was fruitless.

Some effects of bark ringing on the composition of fruit trees, T. WALLACE, V. L. S. CHARLEY, and J. O. JONES (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1930, pp. 52–61*).—Chemical analyses at the Long Ashton Research Station upon the leaves, bark, and wood of current season shoots taken in July from ringed and unringed Bramley Seedling apples showed certain well-marked differences attributable to ringing, namely, higher dry matter, less total nitrogen, and low total ash in fresh weight in all portions of the shoots. In fruit gathered in October, dry matter, sucrose, and total sugars were high and total nitrogen was low in the ringed lots, while acidity, total ash, and the proportions of ash constituents were not significantly affected.

A study of the framework of the apple tree and its relation to longevity, W. A. RUTH and V. W. KELLEY (*Illinois Sta. Bul. 376 (1932), pp. 505–636, figs. 38*).—A comprehensive discussion supported by experimental results is presented upon the relation between the manner of training and pruning young apple trees and their subsequent behavior in relation to productivity and longevity.

As to regional effects on the life of apple trees, those in northern and western Illinois apparently lived longer than trees of the same varieties in southern Illinois. Considerable variation was also evident in the comparative longevity of varieties, Jonathan being classed as a long-lived and Grimes as a short-lived tree.

Wounds are deemed an important factor in the initiation of the unprofitable period of mature apple trees and in the onset of death. Often these wounds are attributable to the manner in which the tree was originally headed. Severe heading of the one-year whip has resulted in vase-shaped trees quite regardless of varieties. In the central leader type with several branches the lower branches often become smothered and lost so that the tree does not actually ever attain a permanent state of equilibrium, and the removal of the dead limbs leaves large wounds with a possible entrance of parasites. Central leader trees seldom break down because of trunk splitting, and if the branch angles are wide the branches are comparatively small.

A method of disbudding was developed and is described in which one-year trees are headed high, 28 to 30 in., and all but three well-placed shoots are

removed. With this method the selected buds are widely spaced, with the result that there is little crowding and little change in the equilibrium as the trees become older. Uniformity is secured among the main branches that are subordinate to the central leader. Comparing three systems of heading, namely, disbudding, summer tipping, and the selection of the framework one year after planting, disbudding is considered the best and is recommended in preference to the other two, and definite suggestions are given for handling young trees in this manner.

Preliminary observations on the nitrogenous materials in apples during storage, M. PILLING and W. H. PEARSALL (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1930, pp. 62–70*).—In a cooperative study between the University of Leeds and the Long Ashton Research Station, apples of known origin and manurial treatments were examined as to nitrogen content after storage at a low temperature, 1° C., and ordinary storage, 5 to 15°. At any given temperature there was little difference in the keeping quality of apples, whether from high- or low-potassium plats, but nitrogen fertilizers did influence materially the amount of core flush. The high-nitrogen apples contained a consistently greater proportion of soluble nitrogen, particularly amino and rest nitrogen. In general protein nitrogen decreased in proportion during storage, with a corresponding increase in rest nitrogen. Apparently protein decomposition occurred, and its products presumably accumulated after passing through the amino and ammonia nitrogen stages.

Investigations on harvesting and handling fall and winter pears, W. T. PENTZER, J. R. MAGNESS, H. C. DIEHL, and M. H. HALLER (*U. S. Dept. Agr., Tech. Bul. 290 (1932), pp. 30, pl. 1, figs. 16*).—Studies carried on in various pear-producing districts indicated that pears allowed to remain on the tree until sufficiently mature had a higher sugar content and less astringent properties and in the case of susceptible varieties less storage scald. On the other hand, delayed harvesting resulted in serious storage and transit troubles such as core breakdown and too rapid softening.

Based on pressure test readings taken in orchards in California, Colorado, Washington, and New York upon pears harvested at intervals during the ripening season and stored and shipped under careful observation, the authors present a table of picking recommendations for important commercial varieties. The variation in maturity date from year to year was such as to render calendar recommendations of little value.

A temperature of from 30 to 31° F. was conducive to the longest storage life, and certain shorter-lived varieties, such as Hardy and Comice, fruit held at this temperature kept from one-third to one-half longer than at 36°.

Precooling pears prior to shipment greatly prolonged their subsequent storage life. At 32° Easter Beurre and Winter Nelis were held for from 7 to 8 months, Bosc 2 to 3 months, Clairgeau 4 to 6 months, Comice and Hardy 2 to 4 months, and Anjou from 4 to 5 months. To attain the highest quality it is suggested that pears be removed from cold storage to ripen at from 60 to 70°, Hardy, Bosc, and Clairgeau being particularly in need of this special treatment.

Bud variation in peaches, A. D. SHAMEL, C. S. POMEROY, and F. N. HARMON (*U. S. Dept. Agr. Circ. 212 (1932), pp. 22, figs. 9*).—An examination of a total of 7,397 peach trees growing in commercial orchards in California, including important canning varieties, revealed 70 well-marked-limb and entire-tree variations, some of which were improvements over the parent variety. Descriptions are presented of many of these variations, some of which have been propagated. Those progeny trees which have reached bearing age have borne fruit of the same characteristics as the parent limb, indicating the permanency of such

mutations and the possibility of perpetuating accidentally or intentionally such aberrant forms. It is believed that canning peaches may be improved by the selection and propagation of desirable mutants.

A study of grades of peaches, R. M. MIDDLETON (*Georgia Sta. Circ. 99* (*1932*), *pp. 7, figs. 4*).—Of 25 factors causing cull peaches, the most important were undersize, overripeness, curculio and other insect injuries, brown rot, handling bruises, and growth cracks. Undersize caused the greatest number of culls in Uneeda and Bell, and bacteriosis was highest in Hale. Growth cracks were serious in Elberta and Carman, and handling bruises were particularly noticeable on Carman, Hiley, Elberta, and Hale. Although a few growers produced fruit 80 per cent of which met the requirements of the U. S. No. 1 grade, the average was 71 per cent. Varieties differed markedly in the percentage of No. 1 fruits. Improvement in orchard management, particularly with regard to spraying, thinning, picking, and handling is recommended as a means of reducing the percentage of low-grade peaches.

A hybrid between peach and almond [trans. title], D. SOSNOVSKIĬ (SOSNOVSKY) (*Trudy Prikl. Bot., Genet. i Selek.* (*Bul. Appl. Bot., Genet. and Plant-Breeding*), *24* (*1930*), *No. 2, pp. 189–203, figs. 9; Eng. abs., pp. 201–203*).—A technical description is given of a fruit cultivated in the Tiflis Botanical Garden, which, from its characteristics and those of the progeny, is deemed an authentic peach-almond hybrid.

Cherry variety test, A. B. FITE and F. GARCIA (*New Mexico Sta. Bul. 198* (*1932*), *pp. 16, figs. 3*).—The results are presented of a test of numerous varieties of sweet, Duke, and sour cherries, data being given on the time of bloom, length of the blooming period, and on the degrees of temperature frequently occurring during the blooming season. Bing, Lambert, and Napoleon were the best of the sweet cherries but because of their intersterility the authors recommend that Black Tartarian be planted with them as a pollinizer.

Fruitfulness in cherries and plums [trans. title], T. SACHOFF (*Gartenbauwissenschaft, 5* (*1931*), *No. 6, pp. 574–579, figs. 4*).—This is a brief contribution from the Pomological Experiment Station in Küstendil, Bulgaria. Of the 12 sweet cherries studied, 11 had the normal complement of 16 diploid chromosomes. The one aberrant variety, Merdjanka, had 17 chromosomes. Of the 4 sour cherries 3 had 32 and 1, Ostheimer Weichsel, 40 diploid chromosomes. Each of the 4 plums possessed 48 diploid chromosomes. It is deemed likely that the Merdjanka cherry may be an F_1 or later segregate from a sour and sweet cross.

All the sweet cherries studied were found self-unfruitful, and intersterility was noted in two combinations, Grosse Schwarze Knorpelkirsche × Hedelfinger Riesenkirsche and Napoleon × Weisse Spanische Knorpelkirsche. Intersterility was complete and reciprocal. The Ostheimer Weichsel and Königin Hortensie sour cherries were found self-unfruitful. The Grosse Grüne Reineclaude plum was found self-unfruitful and the other three varieties strongly self-fruitful. No case of xenia was observed. Insects, especially honeybees, are stated to be the principal carriers of pollen.

The Brainerd blackberry, G. M. DARROW and G. F. WALDO (*U. S. Dept. Agr. Circ. 220* (*1932*), *pp. 4, figs. 2*).—Derived from a cross of the Himalaya and an eastern erect-growing blackberry, this new variety, named in memory of the eminent botanist Ezra Brainerd and herein described in detail, is said to possess wide adaptability, high vigor and productivity, and very good quality when fully ripe.

A preliminary report of the raspberry variety trials at Long Ashton, T. SWARBRICK (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1930, pp.*

27–45, fig. 1).—Records taken over a period of years, 1927–1930, upon the yields of several varieties of raspberries, mostly English types, showed the Improved Beehive variety to be most fruitful, followed by Lloyd George and Baumforth A. Data taken on the yield of individual canes during the same period indicated that the superior cropping quality of any variety lies primarily in the superior production of individual canes. Yields per cane were greatest in the first fruiting season, thereafter declining steadily. The comparative resistance of varieties to mosaic and other diseases is discussed.

Four years' study on the time of flower bud formation in the Dunlap strawberry, J. C. Schilletter and H. W. Richey (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 175–178*).—Summing up the results of four years' studies at the Iowa State College, the authors report that fruit bud differentiation in the Dunlap strawberry did not begin at the same time each year, even in carefully selected and runner pruned stocks. Initiation began in the first week of September in 1924 and 1925, the second week of September in 1927, and the third week of September in 1928. In 1928 the mother plant showed flower bud differentiation first followed in order by the successive plants of the runner series. This order is believed to be the normal process in the strawberry. The differentiation period extended over several weeks and did not occur simultaneously in all the plants.

Grafting American grapes on vigorous stocks, F. E. Gladwin (*New York State Sta. Bul. 607 (1932), pp. 28*).—Supplementing Bulletin 508 (E. S. R., 52, p. 443), further evidence is presented of the superiority of certain grape rootstocks over own roots for growing American grapes such as Concord, Delaware, and Niagara. Planted at Fredonia side by side and given identical care, Niagara on its own roots averaged over a 13-year period 1.78 tons per acre as compared with 3.26, 2.89, and 2.43 tons on Clinton, St. George, and Gloire roots, respectively. Concord on own roots averaged 3.01 tons as compared with 2.93, 2.47, and 3.26 on Clinton, St. George, and Gloire.

Judged on the basis of size and compactness of the cluster, size of berries, and general appearance, quality was improved on practically all rootstocks and was closely correlated with size of the crop and amount of growth. Varieties naturally weak and low producers were improved by grafting, but not to the extent that were naturally strong and productive varieties.

Clinton was apparently the best stock for Catawba, Niagara, and Delaware; Clinton and St. George for Iona; Gloire for Concord on gravelly loam; Clinton for Concord on silt loam; and Clinton and Gloire for Campbell.

In concluding, the author suggests that the cost of grafted vines is prohibitive except for growers with special markets and home gardeners who wish to test them.

[Pecan studies] (*Louisiana Stas., North Louisiana Sta. Rpt. 1931, p. 19*).—A tabulation is presented of the yields, size of nuts, and percentage of kernel in 17 varieties of pecans.

Effect of ethylene on the ripening of bananas, H. S. Wolfe (*Bot. Gaz., 92 (1931), No. 4, pp. 337–366, figs. 8*).—Studies at the University of Chicago showed that, irrespective of the concentration of ethylene gas used, at least 60 hours were required at 22° C. for the development of a full yellow color in Gros Michel bananas. More time was required at 18°, and for really green fruits 100 hours were needed for complete yellowing. The difference between treated bananas and controls was only slight. Analyses showed a slightly higher content of sugars and a slightly greater decrease of starch from day to day in the treated fruit. The concentrations of ethylene ranging from 1 : 100 to 1 : 10,000 appeared equally effective in inducing the small differences obtained.

Bananas at the eating ripe stage contained from 17 to 20 per cent of total sugars, 10 to 14 per cent of sucrose, and less than 1 per cent of starch. Respiratory activity of treated fruits differed little, if any, from the controls when 12-hour periods were considered, regardless of the concentration of ethylene used. The stage of maturity of fruit under test was an important factor, so much so that fruit from the same hand was used in making comparisons.

Citrus propagation in Brazil [trans. title], P. H. and C. Rolfs (*Bol. Unión Panamer., Ser. Agr., No. 72–74 (1931), pp. II+65, figs. 33*).—Discussing the principal species of citrus and the excellent adaptation of the soil and climate of the State of Minas Geraes, Brazil, for citrus culture, the authors present a general account of propagation, from the viewpoint of rootstocks, the growing of seedlings, methods of budding and grafting, the digging and handling of nursery stock, the value of selected parents, etc.

FORESTRY

Seed selection in black wattle (Acacia mollissima), J. B. Osborn (*Empire Forestry Jour. [London] 10 (1931), No. 2, pp. 190–202, pls. 2, figs. 5*).—Black wattle (*A. mollissima*) planted commercially in South Africa for the production of its bark is said to vary between individual trees with respect to vigor, shape, foliage, fruit, thickness of the bark, and tannin content. A study of seedlings grown from seed obtained from different sources and planted in tree row tests showed remarkable uniformity in certain of the lots, whereas others did not breed true to the same degree. A number of the lines were superior in vigor, form, and disease resistance. Recessives with yellow, light green, and blotched foliage were noted in several of the lots, thereby suggesting segregation.

Diagnostic characteristics of the xylem of the North American Abies, E. G. Wiesehuegel (*Bot. Gaz., 93 (1932), No. 1, pp. 55–70, figs. 16*).—Stating that the exact identification of the woods of Abies has always been very difficult, the author as a result of studies at the University of Idaho presents a key to Abies woods based on the color of summerwood and springwood, on the presence or absence of crystals in the rays, on the occurrence of partially biseriate rays, and certain other characteristics.

Stumpage and log prices for the calendar year 1930, compiled by H. B. Steer (*U. S. Dept. Agr., Statis. Bul. 37 (1932), pp. 59, figs. 3*).—Tables are included showing for 1930 data similar to those previously noted for 1929 (E. S. R., 66, p. 744).

DISEASES OF PLANTS

On the diagnosis of certain plant infectious diseases by means of serological reactions [trans. title], T. Matsumoto (*Jour. Soc. Trop. Agr. (Nettai Nôgaku Kwaishi), 1 (1929), No. 1, pp. 14–22; Eng. abs., pp. 21, 22*).—From this attempt to diagnose certain infectious plant diseases by means of serological reactions, it is concluded that "the serological methods may be applied to identify or diagnose certain plant infectious diseases if the expressed juices of the diseased organs are properly added to the antisera prepared from the suspected organisms."

The effect of some mosaic diseases on cell structure and on the chloroplasts, M. T. Cook (*Jour. Dept. Agr. Porto Rico, 14 (1930), No. 2, pp. 69–101, pls. 12*).—The comparative studies recorded in the present paper, dealing with mosaic and with healthy plants of sugarcane, canna, tobacco, tomato, and cowpea, were confined to cell structure and cell contents in the chlorotic areas as contrasted with conditions in the green areas in the same plants and with

healthy plants. They compared only tissues of corresponding ages and excluded accounts of the lesions.

Cell structure in a very young plant is normally very uniform, but differentiation begins early and concludes some time before the leaves are grown. Chlorotic areas of mosaic leaves are thinner than the green ones. The agent inhibits differentiation from its very early contacts.

The spread of the agent through the leaf appears to be very uneven, this fact corresponding to the mottling and variations in thickness, and the unlikeness of the two sides of a given leaf portion.

No evidence appears that the chlorotic area increases in size by the spreading of the virus into adjoining green cells. Such areas increase in size by cell division and cell growth in the chlorotic areas. Plastid development is inhibited as to both size and number. In very young growing leaves it is difficult to locate them in either fresh or stained material, but they develop rapidly with age and exposure to sunlight. The mosaic pattern gradually fades in the older leaves. The chloroplasts increase in size and number with age and exposure to sunlight. No evidence was found of chloroplast disintegration. Plants showing noninfectious chlorosis did not become green with age, nor did the chloroplasts increase in size and number with age and exposure to sunlight.

Instant Bordeaux, F. J. Schneiderhan (*West Virginia Sta. Circ. 60 (1932), pp. 8, figs. 4*).—The author describes a simple, rapid, and exact method of preparing Bordeaux mixture. The designation Instant Bordeaux mixture is given to distinguish the fungicide prepared by this method from that prepared from stock solutions. Seven years of study and experimentation were given to the development of this method, which, it is said, has been adopted by many growers in the Shenandoah Valley.

The mixture is made by using powdered copper sulfate, designated commercially as snow, in place of crystallized copper sulfate and high calcium hydrate instead of quicklime, as recommended in the standard preparation. Directions are given for the preparation of a 2-4-50 formula for use in a 300-gal. spray tank and it is stated that the time required to mix a tank full by this method is only slightly longer than that required to fill the tank with water. The toxicity of Instant Bordeaux mixture was tested for three years for the control of apple blotch, and the percentage of blotch was reduced from 66 per cent for unsprayed trees in 1925 to 4 per cent for sprayed, from 98 per cent in 1926 for unsprayed to 5 per cent diseased fruit in sprayed trees, and from 50 per cent on the unsprayed trees in 1928 to 3 per cent on the sprayed ones.

In preparing this mixture, attention is called to the desirability of using chemical hydrated lime, as ordinary agricultural hydrated lime is unsuited because of its comparative coarseness and the presence of considerable gritty material.

Factors affecting the development of loose smut in barley and its control by dust fungicides, R. W. Leukel (*U. S. Dept. Agr., Tech. Bul. 293 (1932), pp. 20*).—A preliminary report is given of field experiments and observations which seem to indicate that dust fungicides are not effective in the control of loose smut of barley except in certain varieties, in which natural seed inoculation by the loose smut fungus evidently takes place somewhat like that by the organisms causing covered smut or stripe disease. For such varieties the more effective dust fungicides controlled the smut. In other varieties where seed inoculation by the loose smut fungus takes place apparently like that by the fungus causing loose smut in wheat, the hot water treatment is the only one known to be effective in controlling the disease.

It is stated that very wet soil, about 90 per cent saturated, seems to inhibit the development of loose smut and favors its control by dust fungicides. Very dry soil seems to be conducive to loose smut development and unfavorable to its control by dust fungicides. Between these two extremes, other conditions remaining the same, variation in soil moisture does not seem to affect greatly the development of loose smut in barley or its control. A relatively high soil temperature before emergence seems to favor loose smut development more than does a low soil temperature. From 20 to 100 per cent more infection occurred at 25° C. than at 10° in Wisconsin Pedigree No. 5 barley grown from naturally inoculated seed.

There are said to be indications that the influence of environment is not confined to the period of germination and early growth, but may extend over a considerable part of the life of the plant.

The pathogenicity and the variability of Fusarium moniliforme from corn, L. H. Leonian (*West Virginia Sta. Bul. 248 (1932), pp. 16, figs. 6*).—Studies made of 150 isolations from corn seedlings secured from various localities showed that 110 were *F. moniliforme*, 20, *F. culmorum*, and the remaining consisted of various saprophytic forms. Only 20 strains of *F. moniliforme* proved to be pathogenic to corn. Successful inoculations were possible largely through wounds. Seedlings wilted only when inoculated at the base of the stem just below the surface of the ground. Root inoculations yielded only localized infections. Even when newly germinated seedlings were kept on a vigorously growing colony of the fungus in Petri dishes and transplanted in the field after most of the roots had become infected, they grew into normal plants.

Comparatively low temperatures (from 20 to 23° C.) were necessary for successful inoculations. Little or no infection occurred at higher temperatures. Even the most vigorous strains exhibited their pathogenicity in cycles, but at one time they were able to infect the host while at another time and under identical conditions they failed to do so.

Most strains of *F. moniliforme* were found to be extremely plastic and dissociated into many forms. One single-spore isolation produced as many as 50 variants, which differed not only in their pathogenicity but in their morphological and physiological characters.

Late planting to avoid cool, wet soil conditions is suggested as the best method to avoid seedling losses caused by this fungus.

Physiologic races of Ustilago levis and U. avenae on red oats, G. M. Reed and T. R. Stanton (*Jour. Agr. Research* [*U. S.*], *44 (1932), No. 2, pp. 147–153, fig. 1*).—The results are given of a study of a collection of smut specimens, mostly of red oats, for the determination of specialized races of *U. avenae* and *U. levis*.

A hitherto unrecognized specialized race of covered smut which attacks Fulghum oats is reported. As red oats are grown extensively in some parts of the United States, identification of this specialized race may be of considerable economic importance.

Of the 10 collections studied, 2 were found to be typical of *U. levis*, and both showed a high degree of virulence in attacking Fulghum oats. No similar race of covered smut capable of infecting the closely allied Red Rustproof variety was identified.

Studies on "browning" root rot of cereals.—I, The association of Lagena radicicola n. gen., n. sp., with root injury of wheat, T. C. Vanterpool and G. A. Ledingham (*Canad. Jour. Research, 2 (1930), No. 3, pp. 171–194, pls. 2, figs. 7*).—The browning root rot of wheat and other cereals is de-

scribed as widespread over Saskatchewan, causing severe losses in some seasons.

Early in June the outer leaves become discolored, growth is checked, tillering is reduced, and lessening of yield results. One of the chief diagnostic features is the presence of lesioned root tips containing oospores of the Pythium type. The disease is favored by a cool wet spring, followed by warm dry weather. Subsequent good growing conditions may lead to rapid recovery of the cereal. In preliminary work, isolation strains of various fungi from lesioned roots of field material collected in midsummer failed to produce the disease under greenhouse methods of inoculation.

Associated with this rootlet injury in wheat, barley, rye, and maize seedlings was a fungus belonging to the lower Phycomycetes, supposedly hitherto undescribed, the life history, morphology, and physiological characters of which are detailed. It is believed to be an obligate parasite capable of causing definite injury when favored by conditions, though presumably not yet a major cause of the browning root rot. It is regarded as belonging to the Ancylistaceae, close to the genus Lagenidium, but the erection of a new genus Lagena is recommended and for the new form the designation *L. radicicola* has been established, with appropriate technical descriptive account. The soil contains also Pythium forms. There is said to be some evidence that this particular root rot belongs to the Pythium root rot complex type, and investigations were started dealing specifically with browning root rot as related to Pythium strains.

Inheritance of resistance to bunt, Tilletia tritici, in crosses of White Federation with Turkey wheats, F. N. Briggs (*Jour. Agr. Research [U. S.], 44 (1932), No. 2, pp. 121–126, fig. 1*).—A report is given of studies in cooperation with the California Experiment Station of crosses of susceptible White Federation wheat with two resistant Turkey strains, from which the number of factors for resistance and their effect were determined, and also of crosses of the Turkey wheats with Martin to ascertain whether the dominant factor for resistance was present as previously described for Martin (E. S. R., 55, p. 129).

The bunt inoculum used was that designated as physiologic race 3 of *T. tritici*. In the crosses with White Federation the behavior of the progeny in the F_3 rows showed that Turkey C. I. 1558 and Turkey C. I. 3055 each differed from White Federation in one main factor for resistance to bunt. These factors were similar to each other and resembled the second Hussar factor in that about half the heterozygous plants became infected (E. S. R., 62, p. 846). In this respect they differed from the factor for resistance to bunt in Martin, which is completely dominant.

The relationship between morphologic characters and rust resistance in a cross between emmer (Triticum dicoccum) and common wheat (Triticum vulgare), J. B. Harrington (*Canad. Jour. Research, 2 (1930), No. 5, pp. 295–311, pl. 1*).—As a result of this study, which used 15 morphological characters including spike form, spike compactness, stem hollowness, rachis articulation, rachis width, spikelet adherence, glume adherence, keel sharpness, and seed character, all of species-differentiating importance, it is shown that high rust resistance can be transferred without great difficulty from *T. dicoccum* to a *T. vulgare* type. It is concluded that the attainment of desirable combinations of emmer rust resistance with important morphologic characters of vulgare depends primarily upon having a population of many thousands of individuals from which to select.

Effect of the hydrogen-ion concentration of the soil on the growth of the bean and its susceptibility to dry root rot, W. H. Burkholder (*Jour.

Agr. Research [*U. S.*], *44* (*1932*), *No. 2*, *pp. 175–181*).—Field surveys and greenhouse experiments by the New York Cornell Experiment Station have shown that the bean plant was little affected by the H-ion concentration of the soil, and that it thrives well in an acid or alkaline soil. In the bean-growing section of New York State the susceptibility of the bean plant to *Fusarium martii phaseoli* was not affected by the H-ion concentration of the soil.

An analysis of clover failure in Kentucky, E. N. FERGUS (*Kentucky Sta. Bul. 324* (*1931*), *pp. 439–476, figs. 3*).—Red clover failures are reported to have occurred in Kentucky since 1900, and they caused a reduction of more than 50 per cent in the clover acreage between 1899 and 1909.

The studies reported are said to have shown that clover failures in Kentucky are caused by poor soil, southern and northern anthracnose, crown rot, potato leafhopper, and winterkilling. Root rots and black stem disease are contributing causes. Winterkilling is considered the most common cause of failures.

Tests of strains of red clover showed that winterkilling is usually severe on southern European, Chilean, and northwestern domestic clovers, and it destroys northern domestic clovers in severe winters. Southern anthracnose affects northwestern domestic clovers, as well as northern domestic, European, and Chilean lots. It also may kill plants in clovers from the Central States. Northern anthracnose injures southern domestic lots. The potato leafhopper is said to be most destructive to European clovers. The black stem disease is reported to be severe on European clovers and damages northern domestic lots to some extent. Crown rot was found to be more injurious to some clovers than to others. Root rot varies in severity inversely with soil productivity rather than with the clover.

The apparent solution of Kentucky's clover failure problem is said to lie in the use of varieties that have become adapted to Kentucky conditions through years of natural selection within the State.

Treatment of cotton root-rot with ammonia, D. C. NEAL, R. E. WESTER, and K. C. GUNN (*Science, 75* (*1932*), *No. 1935, pp. 139, 140*).—Cultural experiments are said to have shown that the mycelial and conidial stages of *Phymatotrichum omnivorum* were killed by short exposures to ammonia gas, and that where dilute concentrations of the hydroxide were applied under field conditions the fungus was killed in the tissues of cotton roots. Field tests were made to compare the effectiveness of ammonium hydroxide, formalin, and sodium hypochlorite when applied to cotton roots.

Disinfection with ammonia appeared to be more complete than with other chemicals used, and the danger of killing adjacent plants, as by the application of formalin, was avoided. The possibility of utilizing ammonia or ammonium compounds for the control of the disease in cotton fields, as well as for protecting ornamentals or shade trees, is suggested.

Mosaic among the Papilionaceae [trans. title], L. MERKEL (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 39* (*1929*), *No. 8–9, pp. 289–347, figs. 12*).—In this extended systematic account, the mosaic disease symptoms in Phaseolus, Pisum, Lathyrus, Lupinus, and various clovers are presented, with schematic illustrations of the various mosaic leaf types. Both natural and artificial means of transmission have been studied.

Observations on leaf lice show that the virulence decreases more and more the longer the animal carriers are away from the mosaic leaves. The disease has not been known to be carried over winter in the eggs.

Diseases of peppers in Florida, G. F. WEBER (*Florida Sta. Bul. 244* (*1932*), *pp. 46, figs. 38*).—General information is presented on the symptoms and methods of control of various diseases of the garden pepper.

The Rhizoctonia root disease of potato, H. BRAUN (*Der Wurzeltöter der Kartoffel Rhizoctonia solani K. Berlin: Julius Springer, 1930, pp. [3]+136, figs. 17*).—An extended systematic account of the potato root disease caused by *R. solani* deals also in some detail with cultural, technical, and organizational phases of protection against the disease, giving also a bibliography.

***Rhizoctonia* disease in potatoes,** D. B. ADAM (*Jour. Dept. Agr. Victoria, 27 (1929), No. 11, pp. 670, 671, fig. 1*).—Using experimental plats started in 1929 on farms in the Koroit district, and early, mid-season, and late plantings, the present preliminary account describes the effects of parasitization by *R. solani* on the young sprouts from seed tubers.

A new mechanical method for artificially transmitting sugar-cane mosaic, F. SEÍN, JR. (*Jour. Dept. Agr. Porto Rico, 14 (1930), No. 2, pp. 49–68*).—A method, claimed to be mechanical, new, easy, and highly effective for transmitting artificially sugarcane mosaic, is said to have been used at the Porto Rico Insular Experiment Station during the years 1925–1929. The new method in its present form consists in pricking in the inoculum from a slip of mosaic cane leaf held tightly as a band around the exposed spindle of a healthy cane plant. To inoculate small cane plants, maize, and other grasses, the band is held around the stem. Ordinarily pins do not serve, but black No. 0 and white No. 2 Asta insect pins have given equally good results. Ordinarily, about 100 pin pricks insure infection, but the larger the number the better.

The limiting factor seems to be exposure of the virus to the air, and success seems to depend upon the strict limitation of this factor. In resistant or immune cane varieties other factors are involved, and these are as yet imperfectly known. When the cane plant to be inoculated is growing vigorously, the tissues are turgid and the sap is flowing freely. These facts apparently favor infection, owing supposedly to quick closure of the wound and consequent exclusion of the air and possibly to quick transfer of the virus through the plant.

Inoculated susceptible plants, when growing rapidly, show the first symptoms of secondary infection about 15 days after inoculation, and these symptoms resemble in every way those following inoculation through the agency of the insect vector, the corn aphid *Aphis maidis*. The course of the disease is the same in sugarcane plants inoculated artificially as in plants inoculated in nature by the insect vector.

The new method of transmitting mosaic and its practical application [trans. title], F. SEÍN, JR. (*Rev. Agr. Puerto Rico, 25 (1930), No. 2, pp. 64, 65, 94*).—The method of artificial transmission of sugarcane mosaic described above is here discussed briefly in connection with its practical application, as also with reference to statements by Brandes (E. S. R., 49, p. 47), and by Venkatraman and Thomas (E. S. R., 60, p. 152).

Relation of temperature to anthesis and blossom drop of the tomato, together with a histological study of the pistils, O. SMITH (*Jour. Agr. Research [U. S.], 44 (1932), No. 2, pp. 183–190, pls. 5, fig. 1*).—The author claims, from studies at the Oklahoma Experiment Station, that the tomato plant has no definite flowering peak. Flowering seems to be largely dependent upon soil moisture and temperature. The temperature existing for approximately three days before anthesis appears to have the greatest influence on flowering.

It is claimed that blossom drop is greatly increased by hot, dry winds and low humidity, as well as by low soil moisture. There is a lag of approximately three days between the time that temperature exerts an effect on blossom drop and the time that the effect becomes visible.

During the periods of hot, dry winds and low soil moisture the styles elongated abnormally, even before anthesis. Few flowers that have elongated styles in hot, dry weather develop normally and set fruit.

At anthesis the embryo sac of the normal pistil was found to have reached the mature egg cell stage, and under greenhouse conditions no further development of the embryo sac took place for more than 82 hours after anthesis. Growth of the embryo and endosperm occurred between 82 and 94 hours after pollination, and at 190 hours after pollination the embryo had developed to the stage where differentiation was beginning. The embryo sacs of aborting pistils never developed beyond a very weak egg cell stage.

Tomato diseases in Michigan, M. C. Strong (*Michigan Sta. Circ. 139 (1932), pp. 23, figs. 12*).—Information is given in a condensed form for the identification and control of the common tomato diseases in Michigan.

The pathogenicity of Fusarium niveum (EFS.) and the development of wilt resistant strains of Citrullus vulgaris (Schrad.), D. R. Porter and I. E. Melhus (*Iowa Sta. Research Bul. 149 (1932), pp. 121–184a, figs. 12*).—Some results are given of studies of the biology and host relationships of *F. niveum* and of experiments to develop varieties of watermelon resistant to wilt.

The causal organism is said to be soil borne, and primary infection may occur through roots, through runners, and through injuries caused by wind-blown sand.

Studies of 18 cultures of the organism received from widely separated localities were found to differ in a number of characters. Laboratory tests indicated that seedling rot could be prevented partially by treating seed with certain organic mercury compounds. Lime, manure, and commercial fertilizers failed to reduce infection of the variety Kleckley Sweet. Correlations were established between soil and air temperatures and the rate of wilting.

In testing varieties of *C. vulgaris* for resistance to wilt, the edible varieties were found to be generally susceptible, while the inedible ones were resistant. Selections and crosses were made and the progeny tested for several years. Several varieties were produced that are comparatively resistant, and they have been distributed to growers.

The technic for testing varieties in the seedling stage is described.

On the black-spot disease of Dioscorea alata and D. batatas [trans. title], K. Goto (*Jour. Soc. Trop. Agr. (Nettai Nôgaku Kwaishi), 1 (1929), No. 3, pp. 301–313, figs. 7; Eng. abs., p. 313*).—In 1929 the author observed a disease on leaves and stems of *D. alata* and *D. batatas* which proved to be identical with a disease which had been studied since 1926 by him, and which he found in the Prefectures Hiroshima and Yamaguchi.

The casual fungus is said to belong to the genus Gloeosporium, or Colletotrichum if the presence of the setae be stressed. Likenesses and contrasts are discussed. The author inclines to include the fungus under the name *G. pestis*. The pathogenicity of the organism was tested. Distribution of the disease and damages are briefly indicated.

[Plant disease investigations], A. G. Plakidas (*Louisiana Stas., Fruit and Truck Sta. Rpt. 1931, pp. 14–17*).—Progress reports are given of studies on strawberry diseases, Rubus rosette, and the dying of Pineapple pear trees.

Recent investigations on the control of apple scab in the Hudson Valley, J. M. Hamilton (*New York State Sta. Bul. 604 (1932), pp. 44, figs. 3*).—The results are given of two years' experiments on the control of apple scab in the Hudson Valley. Seasonal development of the host and the fungus was found so variable from year to year that it is considered impossible to forecast any economical spray program.

It was found that timeliness and thoroughness of application are more vital factors in the control of apple scab in the Hudson Valley than the choice of any one of several effective treatments. Lime-sulfur 1–40 is recommended as giving the greatest margin of safety of the materials tested. Sprays containing lime-sulfur appeared to be superior to wettable sulfurs if used at the proper concentration. Certain wettable sulfurs were found to be apparently commercially satisfactory, but they seem to be of limited value for use after scab has been established.

Adding lime to the mixture was not found to be of value in reducing lime-sulfur injury on apple foliage and fruit. The use of added lime in dry lime-sulfur and dry mix is also considered questionable. Lime-sulfur 1–40 applied as soon as possible after rain periods, if not before, was found to be more practical if good orchard practice had been followed and scab kept under commercial control. This practice is said to be more effective in a season characterized by a few definite spore discharges than in one in which frequent rains and small spore discharges occur.

Lime-sulfur 1–40 was found to be the most adhesive of the materials tested. Dry lime-sulfur 3–50 is considered to approximate liquid lime-sulfur 1–80. The data indicate that sulfur from the various sprays used, with the possible exception of lime-sulfur 1–40, tended to be present in approximately the same amount for the respective treatments after 2 in. of rainfall or even less. A number of small rains appear to remove more sulfur than one prolonged rain of considerably more precipitation.

Spray injury studies, I, II, W. C. Dutton (*Michigan Sta. Spec. Buls. 218 (1932), pp. 68, pls. 16; 219 (1932), pp. 38, figs. 17*).—In a previous publication (E. S. R., 63, p. 546) the results were given of tests of various fungicides used for the control of apple scab. In the present bulletins the injurious effects of the various materials used are described.

I. *Injuries from summer applications on apples.*—Lime-sulfur, alone or in combination with lead arsenate, was found to cause definite and almost immediate injury, which was characterized by brown leaf tissue in small or large areas. High temperature favored the development of the injury and is considered one of the most important determining factors. High humidity and slow drying favored injury, but low humidity and rapid drying were unfavorable even though the temperature was high. High concentrations of lime-sulfur caused more injury than low concentrations, other factors being equal. Heavy applications are said to be likely to increase injury, and the presence of oil in lime-sulfur may result in more injury than would result from lime-sulfur alone.

Distortion of leaves often resulted from marginal injury by lime-sulfur when the leaves were partly grown. Stunting and blistering of the leaves that appear with the blossom buds may occur as the result of frost injury, and this is sometimes increased by lime-sulfur. Lime-sulfur injury was found to occur often through deep-seated scab lesions on the leaves. It is said that sun scald on the fruit may occur with any spraying treatment, but its development seems to be accentuated by the presence of sulfur in any form.

Dry lime-sulfur was found to cause all the effects observed to follow the use of liquid lime-sulfur, but when used at equivalent concentrations there was usually slightly less injury with the dry lime-sulfur. Differences were also observed between different brands of dry lime-sulfur. Free sulfur sprays, such as dry mix, wettable sulfur, flotation sulfur, etc., were not observed to cause any direct injury to the foliage. Calcium monosulfide did not cause injury to the foliage of the apple.

Yellow-leaf injury is said to follow the use of lime-sulfur and acid lead arsenate, and it is believed to result from the water-soluble arsenic formed when the materials are combined. Much of the russeting of the fruit following the use of lime-sulfur and lead arsenate is believed to be the result of injury from water-soluble arsenic. Blossom-end injury was found to be caused by soluble arsenic in lime-sulfur-lead arsenate sprays and with lead arsenate in other combinations.

Bordeaux mixture sometimes caused injury to the foliage, but this is not usually of consequence in Michigan. The russeting of the fruit, following the use of Bordeaux mixture in early summer applications, is said to be a limiting factor in the use of this spray on apples. Late applications did not cause russeting.

II. *Secondary effects of spray injury to apple foliage.*—Data are here presented concerning the cumulative effects of spray injuries to apple foliage. Fruit set was not found to be affected under normal conditions, but under certain unusual conditions the set of fruit was reduced. Heavy application, frequent application, high concentration, spraying heavily from under the trees, and severe lime-sulfur burn may cause a loss of fruit in the June drop.

Severe injury to foliage is said to affect unfavorably the formation of blossom buds. The production of fruit may be affected in two ways by spraying, either by reducing fruit set or by inhibiting the formation of blossom buds. The premature dropping of fruit just before harvest is often greater where considerable foliage injury has occurred, and the size of the fruit may be affected unfavorably by serious foliage damage. The color development in apples on trees that have suffered severe foliage injury is usually checked, the ground color likely remaining green.

Growth of wood, as determined by measurements of annual rings, is checked where the leaf area has been reduced by spray injury.

The bacterial spot disease of the peach and other stone fruits, J. C. DUNEGAN (*U. S. Dept. Agr., Tech. Bul. 273 (1932), pp. 54, pls. 7, figs. 3*).—An account is given of studies of the bacterial spot disease of stone fruits caused by *Bacterium pruni*.

The symptoms of the disease as they appear on the leaves, fruit, and twigs of the peach are described in detail. The pathological histology of the disease is discussed, and the results of studies on the morphology and physiology of the organism are given. The relation of twig cankers to overwintering is pointed out. No evidence was found to indicate that the organism survives the winter in fallen peach leaves.

Field observations are said to show that the disease is spread through the agency of wind, rain, and dew. The fruit of susceptible varieties is said to be liable to infection any time after the fall of the calyxes. The twigs are susceptible to infection when young and tender and not after the tissues mature.

Where the disease is not severe and on relatively fertile soils, the author states that commercial control can be secured through the use of fertilizers, proper pruning, and cultivation. Where spraying must be resorted to, a zinc-lime spray gives promising results.

Comparative studies on the physiology of Leucostoma leucostoma and Valsa japonica, K. TOGASHI (*Bul. Imp. Col. Agr. and Forestry, Japan, No. 15 (1930), pp. [3]+78, pl. 1, figs. 3*).—The author, citing previous contributions by himself and giving an extensive relevant bibliography, states that the canker or die-back disease of peach trees in the northern part of Japan is caused by two fungi differing clearly in their microscopical characters. These are treated herein as forms of *L. leucostoma* and *V. japonica*, respectively.

This paper deals in systematic detail with the physiological characters of these fungi, with special reference to the influence of temperature and H-ion concentration upon spore germination, mycelial development, and vitality. Cultural characters of local fungi with a comparative study on the related species of foreign and inland sources, as well as the phenomenon of aversion in culture, were also studied in aid of the systematic placing of the above-named fungi.

A new bacterial disease of pears, F. M. Clara (*Science, 75 (1932), No. 1934, p. 111*).—In an investigation of the green fluorescent bacterial plant pathogenes, the author isolated a very pathogenic organism which is technically described as *Pseudomonas utiformica* n. sp. This organism was found to attack flowers, leaves, and fruits of pears, and cross-inoculation experiments produced infections on cowpeas, beans, kudzu, broadbeans, and lilac.

Market diseases of strawberries from the Southeastern States, 1926 to 1930, N. E. Stevens (*U. S. Dept. Agr. Circ. 219 (1932), pp. 4*).—Based on inspections covering over 13 per cent of the total carload movement of strawberries from 11 States for the period covered, the author states that over 40 per cent of the cars were found free from rot, a gain of 8 per cent over that of the preceding 7-year period. The decrease occurred in both Rhizopus and brown rots, more particularly the former. Improved refrigeration and methods of handling are deemed the potent factors in the improvement observed.

Seasonal periodicity of coffee leaf disease (Hemileia vastatrix B & Br.), W. W. Mayne (*Mysore Coffee Expt. Sta. Bul. 4 (1930), pp. [3]+20, figs. 4*).—Careful observations on the seasonal periodicity of coffee leaf disease, continued for more than a year and still in progress, indicate that under the climatic conditions outlined the coffee leaf disease (*H. vastatrix*) increases steadily after the blossom showers throughout the hot weather and the southwest monsoon, establishing itself on 50 per cent of the total number of leaves attacked at the time of maximum intensity of the disease. Following the southwest monsoon, there is a rapid increase in the attack, which reaches a maximum about November 1. After this time the heavy leaf fall masks the rate of spread of the disease, which gradually slows down and reaches the minimum about the time of the blossom showers.

The increase is regular and develops without any appreciable source of infection. The disease starts from the pustules of the previous attack. Heavy and continuous rain appears to check the disease, which is more severe if there are bright intervals in May, September, and October in the district under consideration. Results indicate that the period most profitable for spraying lies between the blossom showers and the beginning of the southwest monsoon, though a post-monsoon spray would help. If only one spray is given the premonsoon application is preferred.

Diseases of the date palm, Phoenix dactylifera, H. S. Fawcett and L. J. Klotz (*California Sta. Bul. 522 (1932), pp. 47, figs. 23*).—The authors describe a number of diseases of the date palm that have been recognized in California and Arizona, as well as several known to occur in other date-growing countries but which have not been reported in the United States.

The more important diseases in California and Arizona are said to be the Diplodia disease, decline, black scorch, brown spot, and black nose. With the exception of the last named disease, which occurs on the fruits, the others attack the leaves or the stems.

The symptoms of the different diseases are briefly described, the causal agency where known is mentioned, and measures are suggested for the control of the different diseases.

Black scorch of the date palm caused by Thielaviopsis paradoxa, L. J. KLOTZ and H. S. FAWCETT (*Jour. Agr. Research [U. S.], 44 (1932), No. 2, pp. 155–166, pls. 2, figs. 5*).—A disease of the date palm that has recently appeared in southwestern United States is described in these studies by the California Experiment Station. It is also known to be of economic importance in northern Africa.

The disease, which is due to *T. paradoxa*, is said to have been found occurring naturally on all parts of the plant except the roots and stem, and these latter organs when artificially inoculated were found to be readily susceptible. Wounding was shown to be unnecessary for infection of the root, fruit strands, petioles, and pinnae. The decay was most serious when it attacked the terminal bud, either killing the palm or, when not fatal, producing the so-called fool disease effect, in which the injured terminal bud grows out laterally.

For the control of the disease, the authors recommend that affected fronds, leaf bases, and inflorescences should be pruned out and the pruning cuts and surrounding tissues protected with some disinfectant. Preliminary experiments indicated that copper sprays, dusts, and various other chemicals might be effective in preventing the disease.

The downy spot disease of pecans, J. B. DEMAREE and J. R. COLE (*Jour. Agr. Research [U. S.], 44 (1932), No. 2, pp. 139–146, figs. 2*).—The authors considered the conidial stage of the downy spot disease of pecans to be identical with *Cercosporella caryigena*, first described as *Cylindrosporium caryigenum* collected in Ontario on specimens of *Hicoria cordiformis*. The perfect stage (*Mycosphaerella caryigena* n. comb.) of the fungus was found to develop on pecan leaves during the fall and winter, but it did not mature until early in the spring. Proof of the relationship of the conidial and perfect stages and of their pathogenicity was determined by inoculation experiments. A description of the fungus and its growth on culture media is given.

The disease is reported to have been observed in Georgia, Florida, Alabama, Mississippi, Louisiana, Arkansas, and Texas.

Control of basal-rot of narcissus, L. E. MILES (*Mississippi Sta. Tech. Bul. 19 (1932), pp. 12, figs. 3*).—Having determined that the basal rot organism was disseminated by the hot water treatment of bulbs for the control of insect pests, the author tested various fungicidal treatments for the control of the basal rot of narcissus.

Bulbs were treated with dusts and solutions following the hot water treatment, and the percentage of diseased bulbs was reduced in every case. The best results were secured with a 1–20 solution of a commercial product which consisted of a finely divided form of calomel. Soaking bulbs in a solution of bichloride of mercury gave rather effective control, but not as good as the calomel preparation.

The author considers that by the use of disinfectants in combination with the standard hot water treatments, the harmful effect of hot water can be overcome and its advantages preserved.

On the causal organisms of the bacterial soft rot of kotyô-ran, Phalaenopsis aphrodite Reichb. f., T. MATSUMOTO and N. OKABE (*Jour. Soc. Trop. Agr. (Nettai Nôgaku Kwaishi), 3 (1931), No. 2, pp. 117–134, pl. 1, figs. 3*).—The authors report studies on the causal organisms of the bacterial soft rot of the orchid *P. aphrodite*, during which cultural characters of the organism were noted.

Slightly alkaline reactions gave the best growth. Growth temperature requirement points ranged about 15° C. for minimum, 34–37° for optimum, and

42° for maximum. The effects of direct sunlight in reducing growth are detailed. The organisms, which are tentatively held to be related to *Bacterium cypripedii*, though more closely to *Bacillus carotovorus* and to *Bacterium betivorus*, attack, besides orchids, onion, radish, carrot, cabbage, cauliflower, kohlrabi, potato, tomato, and fruits of tomato and the common melon.

A Diaporthe canker of American elm, B. G. Richmond (*Science, 75 (1932), No. 1934, pp. 110, 111*).—A description is given of a canker disease of elm trees that was recognized on specimens collected in two localities in Massachusetts. The disease is caused by what is considered to be a species of Diaporthe, the specific identification of which has not been determined. The conidial stage of the fungus is apparently a Phomopsis.

Cronartium comptoniae, the sweetfern blister rust of pitch pines, P. Spaulding and J. R. Hansbrough (*U. S. Dept. Agr. Circ. 217 (1932), pp. 22, figs. 5*).—The sweetfern blister rust, which is said to attack many of the 2- and 3-leaved pines, has for its alternate host the shrubs sweetfern (*Comptonia asplenifolia*) and sweetgale (*Myrica* spp.). The fungus is widely distributed in the eastern and northwestern parts of the United States, extending into Canada, and it is reported to have caused serious damage in forest nurseries in the Northern States.

It is suggested that no sweetfern or sweetgale should be allowed to grow within several hundred yards of nurseries, and if serious losses are to be avoided no large areas of either should be permitted within a mile.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Hibernation in mammals, G. E. Johnson (*Quart. Rev. Biol., 6 (1931), No. 4, pp. 439–461, figs. 2*).—This contribution from the Kansas Experiment Station takes up the subject of hibernation of mammals at length in connection with a list of 124 references to the literature.

Mammals of New Mexico, V. Bailey (*U. S. Dept. Agr., Bur. Biol. Survey, North Amer. Fauna No. 53 (1931), pp. 412, pls. 22, figs. 58*).—This report on the mammals of New Mexico, which follows earlier publications on the results of field work on life zones and crop zones of New Mexico, by the author (E. S. R., 29, p. 755), and a complete report on the birds of the State, by F. M. Bailey (E. S. R., 60, p. 647), after an introduction (pp. 1–7), takes the subject up at length under the heading of an annotated list of species (pp. 7–394). Under each species the distribution, habits, and economic status are treated as fully as the present state of knowledge warrants. A list is then given of the literature cited (pp. 395–399), and this is followed by a subject index (pp. 401–412).

Rats and reindeer in the Antarctic, O. Olstad (*Oslo: Norske Vidensk. Akad., 1930, pp. 20, figs. 7*).—An account of the brown rat (*Mus norvegicus* Erxl.) (pp. 3–9) is followed by an account of the reindeer (*Rangifer tarandus* L.) (pp. 9–19), as observed in South Georgia during the course of two voyages in antarctic waters by the Norwegian Antarctic Expeditions.

The grey squirrel, A. D. Middleton (*London: Sidgwick & Jackson, 1931, pp. VIII+107, pls. 8*).—The introduction and spread of the American gray squirrel in the British Isles, its habits, food, and relations with the native fauna of the country, are dealt with, data relating to which by the author have been noted from another source (E. S. R., 64, p. 746).

The action of strychnine on the Wyoming ground squirrel (Citellus elegans elegans), W. L. Burnett (*Colorado Sta. Bul. 384 (1932), pp. 19*).—This is a report of an economic study concerned with the use of strychnine-poisoned grain for control of the squirrel in the field, where it is necessary

to use control measures for the protection of forage and cereal crops. The experimental work with caged Wyoming ground squirrels has shown that many squirrels possess great inherent resistance to strychnine fed to them on poisoned grain, and that this resistance varies greatly in different individuals. The experiments also have shown that additional tolerance may be built up by daily feeding the poisoned grain in less than lethal doses. The amount of the poisoned grain necessary to kill varies so much with individual squirrels that the author has been unable to decide what should be considered a lethal dose. The data indicate both a progressive tolerance to strychnine, when fed in less than lethal doses, and a gradual accumulation of the poison when fed in quantities exceeding daily elimination, which, if taken too rapidly, may overtake the increased resistance and finally cause death. In one case at least the resistance was gradually built up to a point where the squirrel was able to withstand the total of 250 kernels at a feeding. But when 105 kernels were eaten after a 7-day cessation of feeding and elimination of the poison, death resulted.

Beasts and birds as farm pests, J. Ritchie (*Edinburgh: Oliver and Boyd, 1931, pp. XII+270, figs. 89*).—Following the brief introduction on pests in general (pp. 1–6), section 1 consists of a practical account of the mammalian pests (pp. 7–88) and section 2 of birds as farm pests (pp. 89–260).

Third Bulletin of the International Committee for Bird Preservation, compiled by T. G. Pearson (*New York: Natl. Assoc. Audubon Socs., 1931, pp. [3]+63, figs. 21*).—This is a report of the proceedings of a meeting of the International Committee for Bird Preservation, held at Amsterdam, Netherlands, in June, 1930 (E. S. R., 65, p. 544).

Nicoll's Birds of Egypt, I, II, R. Meinertzhagen (*London: Hugh Rees, 1930, vols. 1, pp. XVI+348, pls. 22, figs. 39; 2. pp. [2]+349–700, pls. 19, figs. 49*).—The work, commenced by M. J. Nicoll in Egypt in 1906, continued until his death in 1925, and completed by the author, deals first with the origin of life in Egypt (pp. 1–37), migration (pp. 38–57), the birds of ancient Egypt (pp. 58–77), and bird protection in Egypt (pp. 78–88). The main part of the work, which extends through the second volume (pp. 89–650), consists of a systematic list of Egyptian birds, with keys for the separation of genera and species. A description, account of the distribution, and field characters are given for each of the forms listed and the identification of many. The several appendixes include lists of bird residents and visitors; a bibliography (pp. 675–680); and a list of the Arabic names of the commoner Egyptian birds (p. 681). A general index of scientific and common names of birds (pp. 683–698) is included.

On the structure and relationships of the nematode Capillaria (Hepaticola) hepatica (Bancroft), H. A. Baylis (*Parasitology, 23 (1931), No. 4, pp. 533–543, fig. 1*).—A brief account is given of the occurrence of *H. hepatica* in various hosts, and it is recorded from the wood mouse in England. "Some additions and corrections are made to the morphological description of '*H.*' *hepatica*, which is shown to possess characters (presence of 'bacillary bands,' presence of a spicule in the male), the supposed absence of which had led to the erection of the genus Hepaticola as distinct from Capillaria. The status of the genera Hepaticola, Eucoleus, Thominx, Calodium, and Liniscus is discussed, and the conclusion is reached that these should all be suppressed as synonyms of Capillaria, which is redefined."

A list of 22 references to the literature is included.

Insect pests of farm, garden, and orchard, E. D. Sanderson, rev. by L. M. Peairs (*New York: John Wiley & Sons; London: Chapman & Hall, 1931, 3. ed.,*

rev. and enl., pp. VII+568, figs. 607).—This new edition of the work previously noted (E. S. R., 45, p. 755) has been revised and enlarged by Peairs.

Insects feeding on truck and garden crops and how to control them, C. C. Compton (*Illinois Sta. Circ. 391* (*1932*), *pp. 48, figs. 21*).—A practical account of insect enemies of truck and garden crops and means for their control.

Asparagus insects in Iowa, C. J. Drake and H. M. Harris (*Iowa Sta. Circ. 134* (*1932*), *pp. 12, figs. 8*).—This practical account deals particularly with the asparagus beetle, spotted asparagus beetle, and asparagus miner.

The present status of control of some Queensland sugar cane pests, R. W. Mungomery (*Queensland Soc. Sugar Cane Technol. Proc., 2* (*1931*), *pp. 230–236*).—A brief contribution on some of the more important sugarcane pests in Queensland and means for their control.

[Contributions on insect enemies of tobacco], J. C. van der M. Mohr (*Meded. Deli Proefsta. Medan, 2. ser., No. 71* (*1931*), *pp. 10, pls. 3; Eng. abs., pp. 4, 6, 9, 10*).—The three contributions that are here presented relate to a mud wasp of the genus Eumenes, the cells of which are sometimes found on the underside of tobacco leaves (pp. 3, 4); a peculiar clotting of tobacco seeds which it is thought may have been caused by the mite *Tyrophagus putrescentiae* (Schrank) (pp. 5, 6); and a damage resembling that of the cigarette beetle found to be due to the attack of the smaller bamboo shot borer *Dinoderus minutus* Fab. (pp. 7–10).

Apple insects in the Hudson Valley and the Lake Champlain fruit districts, P. J. Chapman and O. H. Hammer (*New York State Sta. Bul. 606* (*1932*), *pp. 82, figs. 12*).—This is a report of an investigation of the apple insect problems in the Hudson Valley and the Lake Champlain fruit districts, in which special attention was given to the apple maggot, plum curculio, codling moth, apple curculio, and white apple leafhopper (*Typhlocyba pomaria* McAtee). Specific studies were made to determine the period or periods in the life cycle of the several species when they are most susceptible to treatment as a basis for the development of a schedule of spraying adapted to these regions. Much of the data is presented in chart and table form.

[Contributions on insect enemies of the pecan and their control] (*Natl. Pecan Assoc. Proc., 29* (*1930*), *pp. 40, 42–45; 50–52; 70–75*).—The contributions presented at the annual meeting of the National Pecan Association, held at Jackson, Miss., in September, 1930, include the following: How Some Factors Limit Efforts for Artificial Control of the Pecan Nut Case-Bearer in the Southeast, by G. F. Moznette; Pecan Insects in Mississippi and Their Control, by J. P. Kislanko; and Notes on Parasites of Pecan Nut Case-Bearer, by J. B. Gill.

Review of United States patents relating to pest control, [January–December, 1931], R. C. Roark (*U. S. Dept. Agr., Bur. Chem. and Soils, Rev. U. S. Pat. Relat. Pest Control, 4* (*1931*), *Nos. 1, pp. 13; 2, pp. 12; 3, pp. 11; 4, pp. 14; 5, pp. 11; 6, pp. 10; 7, pp. 15; 8, pp. 12; 9, pp. 12; 10, pp. 10; 11, pp. 9; 12, pp. 14*).—This fourth volume is in continuation of those previously noted (E. S. R., 64, p. 853).

A digest of the literature of Derris (Deguelia) species used as insecticides, 1747–1931, R. C. Roark (*U. S. Dept. Agr., Misc. Pub. 120* (*1932*), *pp. 86*).—This digest of the literature of Derris is arranged alphabetically according to the authors. A subject index and a chronological index are included.

Insecticidal value of certain pyrethrum extracts, H. G. Walker (*Virginia Truck Sta. Bul. 75* (*1931*), *pp. 941–971, fig. 1*).—In the experiments, the details of which are given in tabular form, only a few of the 50 varieties of plants tested showed any evidence of foliage injury by the pyrethrum-soap sprays even at the strong concentrations used.

"The toxic properties of oleoresins extracted by various solvents from uniform lots of pyrethrum flowers as determined by the insecticide tests indicate that alcohol, acetone, and ethylene dichloride are about equally effective in extracting the insecticidal properties. The results of these tests also indicate that benzol and petroleum ether are not as efficient in extracting the active killing principles as are the other three solvents. In the tests conducted, different insects reacted differently to various wetting agents, but in general the soaps, with the exception of the triethanolamine oleate soap, gave better results than the oils. In the case of the [yellow] meal worm larvae, however, triethanolamine oleate soap gave the best results. The toxic properties of oleoresins stored alone and stored in combination with a coconut oil soap for a period of 11 months were not appreciably different. An oleoresin of pyrethrum in combination with a coconut oil soap with a pH of 9.5 retained its toxic properties for at least a month, while a similar mixture with a pH of 12 lost practically all of its toxicity within a period of 12 hours.

"Although rather inconclusive, the results indicate that any factor or set of factors at the temperatures used in these tests (75 to 85° F.) which have a tendency to dry off insects sprayed with a pyrethrum-soap mixture tends to decrease the resulting mortality."

How to control grasshoppers in cereal and forage crops, J. R. Parker, W. R. Walton, and R. L. Shotwell (*U. S. Dept. Agr., Farmers' Bul. 1691 (1932), pp. II+14, figs. 11*).—A practical account of means for grasshopper control.

Tobacco thrips (Thrips tabaci Lind.) as a pest of tobacco plant in Crimea, S. M. Fedorov (*Eos [Madrid], 6 (1930), No. 3, pp. 229–248, figs. 10*).—The author deals with the thrips fauna of the tobacco plant in Crimea, which include seven species and one variety, describes the several stages of the onion thrips, reports studies of its bionomics, with a list of food plants, data on its ecology, economic importance, and control measures.

Thrips tabaci as a vector of plant virus disease, G. Samuel and J. G. Bald (*Nature [London], 128 (1931), No. 3229, p. 494*).—In this further contribution (E. S. R., 64, p. 359), the authors report having shown it to be essential in the transmission of tomato spotted wilt in Australia that the thrips *Frankliniella insularis* should feed on the diseased plant in the larval stage. A reference is made to the finding of Linford in Hawaii (E. S. R., 65, p. 852) that yellow spot disease of pineapple is transmitted by the onion thrips only when it feeds on a diseased plant during its larval stage.

On the oviposition of Tomaspis saccharina Dist. (Rhynch., Cercop.), an insect pest of sugar-cane in Trinidad, A. Pickles (*Bul. Ent. Research, 22 (1931), No. 4, pp. 461–468, fig. 1*).—A report of observations of the oviposition of a cercopid bug which infests the sugarcane fields of Trinidad in vast numbers during the wet months of the year, causing what is known as "froghopper blight," the details being presented in tabular form.

A contribution towards our knowledge of the Aleyrodidae (white flies) of India, K. Singh (*India Dept. Agr. Mem., Ent. Ser., 12 (1931), No. 1, pp. 1–98, pls. 37*).—In this synopsis of the Aleyrodidae of India 44 species are recognized, of which 1 genus (Aleuroclava) is erected and 23 species are described as new. Information on the biology of many of the forms is included, as is a 5-page list of references to the literature.

Coccus (Lecanium) viridis Green, the "green scale" of coffee, N. C. E. Miller (*Straits Settlements and Fed. Malay States Dept. Agr., Sci. Ser. No. 7 (1931), pp. 17–29, figs. 5*).—A summary of information on this widely distributed enemy of coffee.

A new coccid injurious to fruit trees in Baluchistan, F. Laing (*India Dept. Agr. Mem., Ent. Ser., 12 (1931), No. 2, pp. 99, 100, pl. 1*).—Under the name *Aspidiotus prunorum*, the author describes a new species which incrusts the bark of the damson plum, almond, and cherry at Quetta, Baluchistan.

A flacherie disease of silkworms caused by Bacillus bombysepticus n. sp., E. Hartman (*Lingnan Sci. Jour., 10 (1931), No. 2–3, pp. 279–281*).—A Gram-positive organism here described as *B. bombysepticus* n. sp. was found by the author to meet all of Koch's postulates as being the cause of at least one form of flacherie in south China. It has not as yet been determined to be the only form which is normally responsible for the syndrome of flacherie in this region.

Cabbage moth control by non-arsenical sprays, H. Jarvis (*Queensland Agr. Jour., 36 (1931), No. 4, pp. 399–403*).—The work conducted, here reported in tabular form, has shown that both Katakilla (a Derris product) and a nicotine sulfate, soap, and arsenate of lead mixture gave a fairly satisfactory control of cabbage moth in an exceptionally bad season. The plants treated with Katakilla were cleaner and better grown, and the toxic properties of this spray were superior to the nicotine sulfate and arsenate of lead spray.

Experiments with insecticides for codling-moth control, E. J. Newcomer and M. A. Yothers (*U. S. Dept. Agr., Tech. Bul. 281 (1932), pp. 29, pls. 4, figs. 7*).—This is a report of laboratory and orchard experiments for the control of the codling moth with sprays which were conducted at Yakima, Wash., from 1919 to 1929, inclusive. The work was conducted in response to the demand for more effective methods of controlling the codling moth that would not leave objectionable residues.

It was found that "the use of lead arsenate at 2 lbs. to 50 gal., or of an increased number of applications at 1 lb. to 50 gal., improved the control but also resulted in more arsenical residue. Casein spreader, in small quantities, caused the lead arsenate to be somewhat more effective, but in larger quantities it did not have this result. Fish oil also increased the effectiveness of the lead arsenate, but made residue removal more difficult. Soap, glue, and flour paste reduced the value of the arsenical.

Thirteen nonlead arsenicals were tested, but none of them controlled the codling moth as well as lead arsenate and several of them damaged the fruit or foliage severely. Barium arsenate, zinc arsenate, and manganese arsenate were the most effective. Lubricating oil sprays proved to be valuable against the eggs and also had some toxic effect on eggs deposited a few days after spraying, but they did not repel ovipositing moths. There was little effect on the larvae. Heavy or relatively unrefined oils were often injurious to the fruit or foliage. Oil sprays alone were not so efficient as lead arsenate. It is concluded that in order to use oil safely and effectively for codling moth control, a medium oil with a Saybolt viscosity of 65 to 75 seconds and a large proportion of unsulfonatable residue should be added in a proportion of slightly less than 1 per cent to not more than three or four lead arsenate cover sprays.

"Nicotine sulfate was somewhat toxic to codling moth eggs and larvae in warm weather, but by itself was of less value than lead arsenate. Of the materials tested to prevent too rapid volatilization of the nicotine, lubricating oil gave the best results, and very good control was obtained with a combination of nicotine sulfate, diluted to 1–800 or 1–1,600, and a 1 per cent lubricating oil spray. This combination is of value when substituted for lead arsenate in one or more cover sprays. Poor results were obtained with crude dipyridyl sulfate and crude benzyl pyridine. Derris, in the forms tested, was ineffective,

and pyrethrum extracts were effective only for a short time after being applied."

Codling moth experiments, 1929–30 and 1930–31, S. L. Allman (*Agr. Gaz. N. S. Wales, 41 (1930), No. 11, pp. 834–844, figs. 3; 42 (1931), Nos. 10, pp. 810–816, figs. 4; 12, pp. 955–961, figs. 3*).—This is a report upon investigations conducted in continuation of those previously noted (E. S. R., 64, p. 752).

In field experiments in 1929–30, six applications of lead arsenate powder at the rate of 20 oz. in 50 gal. of water resulted in an infestation of 26.2 per cent, four sprayings at the same strength in an infestation of 45.2 per cent, and check trees showed an infestation of 82.5 per cent. Double strength lead arsenate was found to be much more effective than the normal strength. Combinations of white oil emulsions plus lead arsenate gave satisfactory control, but a somewhat similar miscible oil gave less control. A combination of white oil and nicotine sulfate showed some degree of control, with 31.4 per cent infestation.

The percentage of larvae leaving the fruit and captured in the bandages was 62.39; this percentage can be increased by filling crevices on the main limbs and trunks with grafting wax or some similar substance. These results indicate the value of bandaging as a general orchard practice.

In field experiments in 1930–31, lead arsenate with a white oil in the cover sprays gave satisfactory control of the codling moth. The use of lime-sulfur and casein-lime with lead arsenate in five cover sprays gave good results and was superior to white oil with lead arsenate where the oil had been limited to three cover sprays only. White oil at a concentration of 1 part in 100 parts of water with lead arsenate gave as satisfactory results as when used at 1 part in 80 parts of water. White oil with nicotine sulfate is said to have given the best results of all the nonarsenicals tested and is worthy of consideration as an alternative spray where the number of applications of lead arsenate must be limited. Six applications of lead arsenate resulted in 27.53 per cent infestation, four sprayings at the same strength 39.95 per cent, and the control (untreated) plat showed 78.86 per cent infestation.

Codlin moth control experiments, Blackwood, 1930–31, compiled by R. Fowler (*Jour. Dept. Agr. So. Aust., 35 (1931), No. 3, pp. 306–314*).—In the experiments here reported (E. S. R., 65, p. 654), the details of which are given in tabular form, the author found arsenate of lead with fluxit spreader to give fairly satisfactory results when applied five times. The arsenical residue, however, was found excessive. Two sprays of arsenate of lead, namely, the calyx and first cover, followed by three summer oil sprays, gave slightly inferior control of the codling moth but considerably reduced the arsenical residue on the fruit. The best results from the viewpoint of codling moth control were obtained with arsenate of lead blended with a white oil, but this considerably increased the costs of spraying and added greatly to the arsenical residue.

Two citrus fruit borers, H. T. Pagden (*Straits Settlements and Fed. Malay States Dept. Agr., Sci. Ser. No. 7 (1931), pp. 1–16, figs. 10*).—The author deals with the life history and habits of *Prays endocarpa* Meyr. and *Citripestis sagittiferella* Moore, and refers to a chalcid parasite of the former and a tachinid and a braconid parasite of the latter. Control measures are suggested, followed by a brief discussion of the possible application of chemical attrahents.

The European corn borer in western New York, G. E. R. Hervey (*New York State Sta. Bul. 603 (1932), pp. 28, figs. 7*).—This is a report of experiments and observations of the European corn borer conducted from 1928 to 1931 in

Chautauqua, Erie, Niagara, Monroe, Ontario, and Oswego Counties of New York. The study included the seasonal history of the insect, the effect on the rate of infestation of the disposal of infested corn remnants by plowing, and the time of planting.

"Experiments indicate that plowing under infested stalks, stubble, etc., is efficient in destroying a high percentage of the overwintering borers. This practice has the effect of making the hibernating quarters of the borers so unfavorable that many of them are killed underground. The remainder are forced to migrate to the surface of the soil where they are killed by exposure, providing shelter is unavailable. The efficiency of the practice depends on the thoroughness with which it is conducted. Spring and fall plowing appear about equally affective from the standpoint of mortality to the insect.

"The value of community effort in clean-up operations is shown in the record of the infestation in the Eden Valley section in Erie County. In this area the rate of infestation has been held at a low level with little or no injury for the past three years. This is especially significant since it is an early sweet corn area and is located in a district where the insect has been very abundant.

"Where it is possible to delay the planting date until the first week in June or later it has been found that the crop will escape much of the infestation. However, the degree of protection secured is relative and depends chiefly on the intensity of the infestation in any area."

Sugar-cane borers: The mass breeding of Trichogramma minutum to control Diatraea saccharalis in Barbados during 1930, R. W. E. Tucker (*Trop. Agr. [Trinidad], 8 (1931), No. 11, pp. 283–288, pls. 4*).—A detailed account is given of control work with the sugarcane borer in Barbados through production and distribution of the egg parasite *T. minutum*. It is concluded that the results achieved at the cost and with the equipment described are sufficiently satisfactory to warrant an increase in the output of parasites in large enough numbers to give complete control of the pest over the whole island.

A study of condition of coconut trees in the leaf-miner infested area, I, II (*Philippine Jour. Agr., 2 (1931), No. 1, pp. 51–67, pl. 1, fig. 1; pp. 69–81, figs. 3*).—The first contribution, by V. C. Aldaba, deals with the effect of the leaf miner *Promecotheca cumingii* Baly attack on the coconut and of cutting off the leaves, and the second contribution, by V. C. Aldaba, A. Elayda, and E. A. Lanuza, with the probable drop in production of coconut trees within the area infested by leaf miners in Laguna, Tayabas, and Batangas.

The blue stem-borer of ragwort (Homoeosoma vagella), W. Cottier (*New Zeal. Jour. Agr., 42 (1931), No. 5, pp. 333–337, figs. 2*).—An account of a lepidopteran which is the cause of considerable damage to ragwort in different parts of the North Island of New Zealand by boring in the pithy stem.

Some notes on the biology of Queensland sheep blowflies, F. H. S. Roberts (*Queensland Agr. Jour., 36 (1931), No. 4, pp. 404–409, fig. 1*).—The notes here presented relate to six species of the subfamily Calliphorinae attacking sheep in Queensland, namely, *Lucilia sericata* Meig., *Calliphora auger* Fab., *C. stygia* Fab., *Chrysomyia rufifacies* Macq., *C. micropogon* Big., and *Microcalliphora varipes* Macq.

A revision of the North American species of fruit flies of the genus Rhagoletis (Diptera: Trypetidae), E. T. Cresson, Jr. (*Amer. Ent. Soc. Trans., 55 (1929), pp. 401–414, pl. 1*).—In this revision the author recognizes seven species and a subspecies, of which *R. boycei* attacking the exocarp of the Persian walnut in Cochise County, Ariz., and the subspecies *R. suavis completa* infesting the exocarp of the Persian walnut in San Bernardino, Calif., are described as new.

On the biology of the pigeon fly, Pseudolynchia maura Bigot (Diptera, Hippoboscidae), G. R. Coatney (*Parasitology, 23 (1931), No. 4, pp. 525–532*).—This contribution from Iowa deals with the biology of *P. maura*, the pupa and pupation period, sex ratio, and offspring per female and longevity when reared under laboratory conditions by feeding on pigeons (the host in nature), chickens, mourning dove, and man (hosts more or less unsuitable). The effects of its bite are described.

Habits and control of the coconut black beetle (Oryctes rhinoceros L.), C. N. E. J. de Mel (*Trop. Agr. [Ceylon], 77 (1931), No. 2, pp. 99–111*).—An account of a beetle native to Ceylon which is widely distributed in the East and appears to be increasing in importance.

Repellency to the Japanese beetle of extracts made from plants immune to attack, F. W. Metzger and D. H. Grant (*U. S. Dept. Agr., Tech. Bul. 299 (1932), pp. 22, figs. 3*).—This is a report of work conducted over a period of three years, in which 474 extracts, representing 390 plant species belonging to 326 genera and 108 families, were tested. "Several extracts were made from tomato, tobacco, and potato, and certain other plants were extracted in both the fresh and dry states. Although the number of immune plants has by no means been exhausted, it is believed that a fairly comprehensive survey has been made.

"Only 56 extracts gave any indication of repellency. Thirteen of these were commercial extracts which probably repelled because of a conspicuous residue deposited on the foliage. Other white materials, such as lime and the New Jersey dry mix, repelled equally as well. The repellent value of 11 other extracts was doubtful, as they were applied after the peak of the beetle season and were not subjected to such a severe test as were many of the other extracts. The repellency of these materials was much less than that shown by powdered Derris and pyrethrum applied in spray form at the rate of 3 lbs. to 50 gal. of water. Ten extracts, each used at full strength on corn, were repellent, but only three were of possible value. All three burned the husks severely. . . . Of the 22 extracts showing repellency on small peach and apple trees, 15 were repellent on small apple, 6 on small peach trees, and 1 on small peach and small apple trees. One extract showed some repellency on smartweed in cages, and 1 on a large peach tree. Three extracts were repellent on both corn and apple."

A table giving the botanical classification of plants extracted, together with solvent, part used, and rate of application, is included (pp. 12–21).

Biological notes on adult Leucopholis irrorata Chevrolat, with a consideration of beetle collecting campaigns as a method of control against white grubs, L. B. Uichanco (*Philippine Agr., 19 (1930), No. 3, pp. 133–155, figs. 3*).—This contribution relates to *L. irrorata*, the white grubs of which are the most destructive forms which occur in the Philippines, owing to greater number and wider range of adaptability to different soil types. The females are said to contain an average of from 3.11 to 5.2 eggs per individual, 32, the maximum number, having been found in only one.

The control of the bean beetle in New Mexico, J. R. Douglass (*New Mexico Sta. Bul. 199 (1932), pp. 14, figs. 14*).—In cooperative work with the U. S. D. A. Bureau of Entomology it was found that while the Mexican bean beetle is the most serious insect enemy of beans in New Mexico, it can be controlled by applying calcium arsenate to the plants at the right time and in the right way. It is recommended that growers apply control measures to kill the overwintered beetles rather than the larvae or slugs. Both dusting and spraying with calcium arsenate have been used successfully as a means of control. Dust-

ing and spraying machines that are equipped with booms and nozzles specially built to apply the poison to the under sides of the leaves are necessary for proper application of calcium arsenate. In the large bean-growing districts, such as the Estancia Valley where the beetles overwinter only on one side of the valley and infestations of the bean fields occur from one direction only, the beetles can be controlled more economically by cooperative effort than by the individual.

Report on the coffee berry borer, Stephanoderes hampei Ferr, in Java, L. C. Coleman (*Mysore Dept. Agr., Gen. Ser. Bul. 16 (1931), pp. 26, pls. 5*).—This report on *S. hampei* in Java is based on a trip made through the island in the fall of 1930.

The apple blossom weevil.—The results of further investigations upon its control, A. M. Massee (*East Malling [Kent] Research Sta. Ann. Rpt., 17 (1929), pt. 1, pp. 89–93*).—The author has found that corrugated cardboard bands are more successful than sack bands for trapping the apple blossom weevil, and strips of old carpet felt also proved to be superior to the sack bands when tested under similar conditions. The weevils could be killed by spraying the bands in situ on the trees by means of a 10 per cent tar distillate wash. The weevils hibernating under the loose bark, and those hiding in the sacking which is placed around the trunks of staked trees to prevent rubbing and damage by the string are also killed by the winter wash.

Iowa Beekeepers' Association (*Iowa State Hort. Soc. Rpt., 65 (1930), pp. 397–498, figs. 19*).—Among the contributions presented at the nineteenth annual convention of the association held at Shenandoah in November, 1930, are the following: California contra Foulbrood, by F. E. Todd (pp. 407–410); The Ohio Plan for Bee Disease Eradication, by C. A. Reese (pp. 410–412); The Winter Activity in the Honeybee Cluster, by C. L. Corkins (pp. 415–420); Preparing Bees for Winter, by J. A. Munro (pp. 421–423); How Bees Winter, by F. B. Paddock (pp. 423–438); The Granulation of Honey, by E. F. Phillips (pp. 448–451); The Evaluation of Bees for Pollination, by C. L. Farrar (pp. 451–454); and A Catalog List of American Bee Journals, including Canada and the United States, with a List of the Numbers and Volumes in the Miller Memorial Library, July 1, 1930 (pp. 462–471).

Sugarcane borer control by field colonization of Trichogramma minutum in 1931, W. E. Hinds (*Sugar Bul., 10 (1931), No. 6, pp. 3, 4*).—In work conducted at the Louisiana Experiment Stations during the year 1931 in continuation of that previously noted (E. S. R., 63, p. 261), the field colonization of an average of from 5,000 to 6,000 egg parasites per acre was effective in preventing from one-third to one-half the actual borer damage which might have been expected in these areas had no colonization of parasites occurred. The actual cost per acre for this protection in 1931 was approximately $1. The data obtained indicate that the period soon after egg laying of the second or third generation of moth borer begins is the strategic time for starting a colony of the egg parasite.

Parasites of the wheat-stem sawfly, Cephus pygmaeus Linnaeus, in England, G. Salt (*Bul. Ent. Research, 22 (1931), No. 4, pp. 479–545, figs. 29*).—The wheat stem sawfly which occurs in the United States (*C. cinctus* Nort.) having become one of the major insect pests of wheat in western Canada, a study was made of the European parasites of *C. pygmaeus* with a view to employing them against *C. cinctus*.

Part 1 of the report of studies consists of a general account of the investigation (pp. 480–487), part 2 of notes on *C. pygmaeus* (pp. 487–492), part 3 of descriptions of the nine parasites studied (pp. 492–541), and part 4 of natural control of *C. pygmaeus* (pp. 541–543). The parasites studied and considered

at length are *Hemiteles hemipterus* Fab., which is a primary parasite though acting as a hyperparasite in certain cases; *Collyria calcitrator* Grav.; *Pimpla detrita* Holmgren; *Microbracon terebella* Wesm.; and *Pleurotropis benefica* Gah. The other four species, briefly noted, are *Leptocryptus bellulus* Kreichb., *Microcryptus unifasciatus* Schmiedeknecht, *Pezomachus fallax* Foerster, and *Gambrus tricolor* Grav.

In the field it was found that in the absence of even the best of the other parasites there was comparatively little difference in the numbers of Cephus if *Collyria calcitrator* remained. The very high frequence of *C. calcitrator* in England; its perfect adaptation to and complete concentration on the wheat-feeding Cephidae; its independence of alternate hosts; and its ability, as indicated by its wide range, to exist under very different climatic conditions all give reason to expect that its introduction will have a very benefical effect on the sawfly infestation in Canada.

The account is accompanied by a list of 55 references to the literature.

Colonisation in Canada of Collyria calcitrator (Hym. Ichn.), a parasite of the wheat-stem sawfly, C. W. Smith (*Bul. Ent. Research, 22 (1931), No. 4, pp. 547–550*).—This is an account of the introduction from England of *C. calcitrator*, noted above, and its liberation—6,323 in number—in western Canada in June, 1930, as an enemy of the wheat stem sawfly. It is said to be now certain that this parasite has successfully attacked the wheat stem sawfly and has developed in the new host to the second larval stage.

Studies with control of the larch sawfly [trans. title], G. Takagi (*Chosen Govt. Gen. Forest Expt. Sta. Bul. 12 (1931), pp. 7–78, pls. 8, figs. 18; Eng. trans., pp. 1–35*).—In his studies of the larch sawfly in Chosen, the author has found the injury to be caused by three species which are described as new under the name *Pachynematus laricivorus*, *P. nigricorpus*, and *Diprion koreana*. A detailed account is given of the life history and habits of *P. laricivorus* and descriptions of nine of its hymenopterous parasites, of which seven species and one variety are new to science.

The control of the fruit tree red spider on plum, A. M. Massee (*East Malling [Kent] Research Sta. Ann. Rpt., 17 (1929), pt. 1, pp. 85–88, pl. 1*).—The author finds that the fruit tree red spider can be controlled by spraying the plum trees during the growing season, about two weeks after the blossoms have fallen, with a lime-sulfur spray at the rate of 1 gal. of lime-sulfur to 99 gal. of water plus 1 lb. gelatin. This spray did not reduce the crop nor cause any injury. White oil emulsion (1 per cent) and Bordeaux mixture (8–12–100) did not control the mite.

ANIMAL PRODUCTION

Investigations into the intensive system of grassland management.—I, The chemical composition of intensively treated pasture, A. W. Greenhill (*Jour. Agr. Sci. [England], 20 (1930), No. 4, pp. 573–586, figs. 4*).—This study was undertaken to compare the chemical composition of samples of grass grown under the intensive system of grassland management and samples from untreated pastures.

The nutritive ratio of pasture grasses was a little wider in a dry than in a wet season, but the average fiber content was not greatly different. Drought or early rapid growth of the grass brought about a slight reduction in protein content and an increase in fiber content, but these conditions were changed following the end of the drought or the period of rapid growth. A grass which produced a good growth of young leafy herbage had a higher nutritive ratio on a dry matter basis than a plant with a stemmy growth. The protein

content of grasses from pastures heavily fertilized was higher than that from untreated pastures. The author discusses the relation of this higher protein content to the higher milk-producing power of these pastures and its relation to the question of supplementary feeding.

The vitamin value of cod liver meal, A. D. Holmes, M. G. Pigott, and D. F. Menard (*Jour. Nutrition, 4 (1931), No. 2, pp. 193–201, figs. 2*).—In this test eight lots of 20 Rhode Island Red chicks each were fed for 8 weeks in brooders where no direct sunlight was available. The four experimental lots received the basal ration plus 2 per cent of four different commercial cod-liver meals, while the four control pens received cod-liver oil at levels of 0.13, 0.25, 0.5, and 0.5 per cent of the ration. At the end of 3, 5, and 8 weeks, four representative chicks were removed from each lot for ash and calcification determinations.

One of the cod-liver meals was found to have an antirachitic value equivalent to 0.5 per cent of cod-liver oil. Another meal was almost as good, but the other two meals possessed little, if any, vitamin value.

Fourth year's results of crossbreeding studies in the production of California spring lambs, R. F. Miller (*Natl. Wool Grower, 21 (1931), No. 7, pp. 19, 20*).—Continuing this study at the California Experiment Station (E. S. R., 65, p. 365), it was shown in this phase that when mated to straight Rambouillet ewes Hampshire rams produced carcasses superior to rams of the other breeds, these ranking in the following order: Shropshire, Suffolk, Southdown, and Rambouillet.

The crossbred ewes were found to be somewhat better mothers and their lambs usually graded higher when dressed than the Rambouillet ewes. The value of carcasses from the crossbred ewes ranked as follows: Hampshire, Suffolk, Shropshire, and Southdown.

The place and management of sheep in modern farming, J. E. Quested et al. (*[Rothamsted Expt. Sta., Harpenden], Rothamsted Confs., No. 12 (1931), pp. 68*).—In addition to actual experiences in the handling and management of sheep by practical breeders, this pamphlet gives a summary of tests carried out with sheep at the South-Eastern Agricultural College, England.

Feeding and carcass tests, C. Harper, L. D. Burk, and D. A. Spencer (*Natl. Wool Grower, 21 (1931), No. 5, pp. 11–15, figs. 8*).—Carcass tests, by the U. S. D. A. Bureau of Animal Industry, of lambs fed cooperatively with the Indiana Experiment Station (E. S. R., 65, p. 61) showed that the average grade of carcasses in the Rambouillet lot was low good, while in the Corriedale, Hampshire-Rambouillet, and Hampshire-Corriedale lots the average grade was good. There were more choice and fewer medium grade carcasses in the last three lots than in the first lot. The live grades of the lambs checked rather closely with the carcass grades.

DAIRY FARMING—DAIRYING

A comparison of alfalfa, sweet clover, and Sudan grass as pasture crops for dairy cows, T. M. Olson and B. L. Robinson (*South Dakota Sta. Bul. 265 (1931), pp. 23*).—Continuing this work (E. S. R., 61, p. 66), Sudan grass during its short season carried more cows per acre and produced more milk and butterfat per acre per day than either alfalfa or sweetclover. The two latter pastures furnished more cow days of pasture per acre and produced more total milk and butterfat for the entire season than did Sudan grass. The sweetclover pasture was somewhat better in these respects than alfalfa pasture.

Cows lost more weight per head on Sudan grass than on either alfalfa or

sweetclover, and the animals on alfalfa lost less weight than those on sweetclover. The sweetclover ranked first in the production of total digestible nutrients per acre for the season, followed by alfalfa and Sudan grass, and the same ranking held for net profit and for milk and butterfat produced per acre.

The Sudan furnished most of its pasture during July and August when many other pastures were drying up. When first turned on sweetclover pasture the animals showed a slight dislike for it and a similar but less pronounced tendency was noted toward alfalfa. Sweetclover required the least amount of grain per 100 lbs. of milk and per pound of butterfat produced, and alfalfa required the most grain. No cases of bloat occurred on either the alfalfa or sweetclover pastures used in these tests.

Emmer (speltz) for dairy cows, T. M. Olson (*South Dakota Sta. Bul. 264 (1931), pp. 11*).—Continuing this study (E. S. R., 64, p. 673), the two trials with 12 high-producing cows indicated that emmer was equal to barley for maintaining the milk production and the body weight of the animals. Emmer was as palatable as barley, and no physiological differences were noted in the effects of the two feeds upon the cows except in the case of one animal which refused to eat emmer. Emmer should be coarsely ground, and it is preferable to remove practically all the hulls for feeding dairy cows. Emmer may be substituted pound for pound for barley without affecting the nutritional value of the ration.

The vitamin A, B (B_1), and G (B_2) contents of milk throughout the year, F. L. MacLeod, J. B. Brodie, and E. R. MacLoon (*Jour. Dairy Sci., 15 (1932), No. 1, pp. 14–22, figs. 2*).—Quantitative data obtained by the technic developed by Sherman and coworkers are reported on the content of vitamins A, B (B_1), and G (B_2) in raw milk from one dairy of stall-fed cows at different seasons of the year. The ration in this dairy is described as containing an alfalfa hay of excellent quality, a good silage, and a concentrate. Milk from this dairy had previously been found to have a high and constant content of vitamin C throughout the year (E. S. R., 57, p. 869).

The milk was found to contain per gram from 1.3 to 2 units of vitamin A, about 0.1 unit of vitamin B, and about 0.3 unit of vitamin G. The vitamin A and G values were quite constant throughout the year and the vitamin B values varied slightly with the season, being highest in the spring and lowest in the summer.

Is the vitamin B content of milk under physiological control? F. L. Gunderson and H. Steenbock (*Jour. Nutrition, 5 (1932), No. 2, pp. 199–212, figs. 4*).—This paper includes a critical discussion of contradictory reports in the literature concerning the value of milk as a source of vitamin B, from the early differences reported by Hopkins and Osborne and Mendel before the multiple nature of vitamin B had been discovered to recent investigations involving only vitamin B (B_1) and original data obtained before and after the differentiation of vitamin B.

The earlier data which were obtained in a series of experiments undertaken in 1920 to test the influence of breed, pasture, early and late lactation, and variations in the vitamin B (complex) content of the ration on the vitamin B content of cow's milk showed that the latter was not subject to variations with breed, the addition of succulent feed, or an increase in the vitamin B content of the ration by replacing part of the grain with wheat germ. In the later experiments, which were carried on with cow's milk and goat's milk, coprophagy was prevented by the use of screen cage bottoms, and due recognition was given to the existence of other vitamins in the vitamin B complex. The cow's milk was obtained from the university herd, consisting chiefly of

Holsteins, with some Jerseys, Guernseys, Ayrshires, and Brown Swiss. The goats were purebred Toggenbergs or grades. Three rations were used in the goat-feeding experiments. Each consisted of 0.75 lb. of alfalfa and 1.5 lbs. of grain mixture. The latter included a basal mixture of 35 parts of yellow corn meal, 30 of wheat brain, 5 of linseed oil meal, and 1 of sodium chloride. This was supplemented in one case by 30 parts of oats to make what was called the barn ration, 30 parts of wheat germ to make the wheat germ ration, and 15 parts each of yeast and oats to make the yeast ration.

Feeding tests on rats showed that as a source of vitamin B 3 parts of yeast were equivalent to 6 of the wheat germ and 20 of oats. From these findings and separate assays of the three rations, it was estimated that the vitamin B content of the yeast and wheat germ rations was practically double that of the so-called barn ration.

Both the cow's milk and the goat's milk were fed at levels of 2, 4, 8, and 12 cc daily. With the cow's milk very little improvement was evident on 2 and 4 cc, and on 12 cc growth was not quite normal. The results with goat's milk were essentially in the same order but slightly better. There was no appreciable difference between the growth produced by the same amount of goat's milk from the various rations differing markedly in their vitamin B content.

These results are discussed with reference to recent reports in the literature indicating the inefficiency of lactating human subjects in transferring vitamin B to their milk and the suggested need of supplementing the diet of infants with vitamin B, with the conclusion that "our findings that cow's milk and goat's milk can not have their vitamin B content increased beyond the usual level emphasize the necessity for recognizing the definite limitation of cow's and goat's milk in normal human nutrition as claimed by others. It remains to be seen whether or not our findings and the findings of those who claim that cow's milk should be fortified with vitamin B for infant feeding will be supported by future investigations. Obviously, there are many possible variables which enter into the determination of such general relations, and in the face of everything Hopkins' outstanding conclusions need to be harmonized with those of others."

The influence of environmental temperature on the percentage of butter fat in cow's milk, H. J. Brooks (*Jour. Dairy Sci., 14 (1931), No. 6, pp. 483–493, figs. 2*).—In this study at the Kansas Experiment Station such factors as stages of lactation and gestation, condition of animal, feeding, and breed differences were eliminated, and only 365-day records were used. A total of 409 lactations were taken from the records of the station herd over a period from 1912 to 1927. The mean temperature for each month for this period was taken from the weather reports for the Manhattan district. A true average of butterfat percentage, obtained by dividing the total fat produced by the total milk produced, was used.

Confirming previous conclusions, this study showed an inverse correlation between environmental temperature and the percentage of fat in cow's milk. The relationship could be expressed by the coefficient of correlation $r=-0.872\pm 0.046$. The relationship assumes a distinct linear regression characterized by the regression equation $y=4.41-0.0064x$, in which y equals the percentage of butterfat and x equals the temperature in degrees Fahrenheit. The same relative relation was maintained in each of the four major breeds of dairy cattle, marked by greater fluctuations in the higher testing breeds. When the stage of lactation was eliminated, the amount of milk produced by a group of cows in a given period did not appreciably affect the percentage of fat in the milk.

The relation between milk production and percentage of fat could be expressed by the coefficient of correlation $r = -0.167 \pm 0.19$. Environmental temperature exerted a greater influence on percentage of butterfat in milk than did the stage of lactation.

Effect of single and double homogenization of cream upon coagulation by heat and rennet and upon separation of the fat, B. H. WEBB (*Jour. Dairy Sci., 14 (1931), No. 6, pp. 508–526, figs. 7*).—This study was undertaken by U. S. D. A. Bureau of Dairy Industry to determine the effect of single and double homogenization upon the coagulation of cream by heat, by alcohol, and by rennet. The results showed that coagulation by alcohol was the same as the coagulation by heat. The effect of rennet was determined by adding 5 cc of a rennet solution made by dissolving 0.5 g of powdered rennet in 200 cc of distilled water to 230 cc of cream at 37° C. and recording the time which elapsed from the time the rennet was added until the first visible curd was produced. Heat coagulation was determined by placing homogenized cream in baby-sized tins and sterilizing at 120° and the time of coagulation taken upon the appearance of visible curd.

Homogenization decreased the stability of cream toward coagulation by heat and by rennet, and the differences in temperature and pressure of homogenization affected the time of coagulation by either heat or rennet in a similar manner. Double homogenization at 80° with the second stage of the valve at about 500 lbs. pressure was beneficial in increasing heat stability of creams containing more than 15 per cent of butterfat, but the use of 2,000 lbs. pressure on the second stage decreased heat stability below that obtained by single-stage processing. A noticeable separation of fat occurred in sterilized sweet cream homogenized at pressures as high as 4,000 lbs. when stored for several months. Increasing pressures of homogenization retarded the rate of rise of fat in proportion to the pressure used. The fat of rehomogenized cream separated to a lesser extent than that of cream homogenized once.

The relation of feathering and heat stability of cream to fat clumping produced by homogenization, F. J. DOAN (*Jour. Dairy Sci., 14 (1931), No. 6, pp. 527–539*).—The Pennsylvania Experiment Station undertook to determine whether there was a relationship between the degree of fat clumping in homogenized cream and the stability of such cream toward heat.

The results indicated that the degree of fat clumping in normal, sweet, homogenized cream was probably the most important single factor affecting heat stability. The mechanical destruction of the fat clumps improved stability. It was believed that the fat clumps acted as a structure on which casein coagulated readily, and that such casein, having lost its mobility and its hydration, was rendered more susceptible to the agents of coagulation.

Double homogenization or the use of a two-stage valve was effective in improving the stability of cream compared with a single processing treatment. Double homogenization made it possible to use a higher total pressure and to obtain better homogenizing efficiency, which was particularly important in the manufacture of sterile cream. The addition of milk solids in the form of condensed skim milk or skim milk powder under some conditions increased the stability of the cream, but excessive additions to any cream or any additions to some creams brought about a loss in stability.

In general, cream should not be homogenized at a temperature lower than that to which it is preheated, unless this is over 170° F. for 30 minutes or 180° flash. When salt stabilizers are used, they should be added prior to homogenization for best results for they hinder formation of fat clumps. The heat coagulation point of sterile cream and the tendency of homogenized cream to

feather in coffee generally parallels the degree of fat clumping but in an inverse fashion.

Fast frozen sweet cream, R. V. Grayson (*Concent. Milk Indus., 2 (1931), No. 1, pp. 18, 21; abs. in Ice Cream Rev., 15 (1931), No. 2, p. 37*).—The author describes a satisfactory method for the fast freezing of milk. This method consists of placing the pasteurized and homogenized milk in the receiving reservoir of a de-aerating freezing unit where a vacuum of 29.8 in. was maintained for 20 minutes, after which the milk was passed into the freezer where it was frozen to a slush in 4.5 minutes while still under a high vacuum. The slush was then run into 1 gal. stone jugs of thermos type and sealed under 15 in. of vacuum. The jugs were placed in a freezing unit which reached a temperature of −45° F., and the mixture was frozen hard in 1 hour 55 minutes. The product was stored at 0° and when compared at 30-day intervals with fresh milk showed little if any change in quality.

Further remarks on data on bacterial counts presented by Brew and Dotterrer and analyzed by Brew, G. A. Baker (*Jour. Dairy Sci., 14 (1931), No. 6, pp. 477–482, figs. 2*).—The author of this article suggests a method for comparing estimates of the number of bacteria in milk as made by different methods (E. S. R., 39, p. 76).

The destruction of ropy and bitter milk organisms by hypochlorite, C. K. Johns (*Sci. Agr., 12 (1931), No. 1, pp. 38–42*).—Continuing this work at the Central Experimental Farm, Ottawa, Ont. (E. S. R., 64, p. 68), a study was made of the speed of destruction of various organisms by hypochlorites. The germicides used were B–K (a liquid sodium hypochlorite), Diversol (a sodium hypochlorite compound with trisodium phosphate), and H T H (a calcium hypochlorite powder). Five ropy and two bitter organisms were used in the work. The stability of the concentrated hypochlorite products was determined at the start and after 6 months' storage at room temperature.

The results showed that the less alkaline hypochlorites, B–K and H T H, were very effective in destroying all seven types of organisms. Diversol, a more alkaline hypochlorite, destroyed certain organisms rapidly, while other organisms showed varying degrees of resistance. No marked differences were found in the stability of the concentrated products.

A study on methods for determining numbers of moulds and yeasts in butter, I, II, A. H. White and E. G. Hood (*Jour. Dairy Sci., 14 (1931), Nos. 5, pp. 463–476; 6, pp. 494–507*).—This study was undertaken by the department of agriculture, Ottawa, Canada.

I. *The relation of the pH of the medium.*—The aim was to determine the relation of the pH of the medium to the growth of pure cultures of yeasts isolated from butter and to yeast counts as obtained from butter itself. In the first part of the study 63 pure cultures of yeasts were isolated from numerous samples of commercial and exhibition butter. For the second part of the work 50 samples of butter were analyzed, and these included both pasteurized and unpasteurized butters representative of different grades. For both yeast cultures and butter samples, plates were poured in duplicate on media having pH values of 3, 3.4, 3.8, 4.2, and 4.6 and incubated at 25° C. for 5 days. Counting was done with the naked eye.

With the pure yeast cultures there was no significant difference in the average counts or the counts of individual cultures at the various pH values. With butter samples the yeast counts decreased slightly as the pH value of the medium increased. However, the differences in counts at from 3.4 to 4.6 were insignificant for routine control work. At pH values of 3.4 and 3.8 no bacterial colonies were found on the plates, but with butter samples many

colonies were evident at pH values of 4.2 and 4.6. The pH value of the medium had no apparent effect on the size or rapidity of growth of the yeasts from pure cultures or from butter. There were no indications that the pH values of the media had any effect on mold growth. It was concluded that a pH value of 3.5± allowed a margin of safety in standardizing the medium and was satisfactory for the routine analysis of butter for molds and yeasts.

II. *The influence of temperature and time of incubation.*—A study was made of the temperature and time of incubation employed in making mold and yeast counts of butter with a view to the adoption of a uniform temperature and incubation period so that results from different laboratories would be comparable. Studies were carried out with molds and yeasts on 39 samples of butter and also with 40 cultures of representative yeasts isolated from butter plates. The incubation temperatures used were 25, 30, and 37° C., and plates were counted after 48 hours and again after 5 days. A Bacto malt agar, dehydrated, and acidified to pH 3.5± with a 5 per cent lactic acid solution just before using, was the medium employed. Counting was done with a hand lens.

The average mold and yeast counts of all samples and the counts for the majority of individual samples were slightly higher at 25° than at 30° for both incubation periods. The difference, however, was not of practical significance. At 37° the counts were appreciably lower than at 25° or at 30°. Some of the molds and yeasts did not grow at all or made but little growth at the higher temperature. There was less variation in yeast counts of individual samples at the lower temperatures for the longer incubation period. The counts of molds and yeasts were generally higher after an incubation period of 5 days than after 48 hours, and at the longer periods counts could be made with the naked eye at all temperatures used. It was evident that even for the incubation period of 48 hours there was no advantage in using a higher temperature than 25° from the standpoint of size of colonies and rapidity of growth.

These results indicate that for comparable yeast and mold counts a uniform temperature and incubation period should be adopted, and that 25° for 5 days gave the most satisfactory results in this study. When a shorter incubation period is used, counting should always be done with a hand lens.

Red-spotted molded butter [trans. title], F. W. J. Boekhout and J. van Beynum (*Dept. Binnenland. Zaken en Landb. [Netherlands], Verslag. Landbouwk. Ondersoek. Rijkslandbouwproefsta., No. 36 (1930), pp. 5–14, pls. 3; Eng. abs., p. 14*).—In a study at the Imperial Agricultural College, Hoorn, a red-colored mold was isolated from moldy butter, using a medium made of distilled water to which 2.5 per cent of agar agar had been added. After from 7 to 14 days' growth blackish spores appeared on the mycelium, and these spores could be grown on the usual media. The organism apparently grew best and produced the best color on Witte's peptone and levulose, while dextrose and galactose produced fairly good results. The thermal death point of the organisms was found to be 48° C. for 10 minutes. This organism, which was tentatively identified as *Epicoccum heterochroum*, was more sensitive to salt and less sensitive to lactic acid than *Cladosporium herbarum*. This mold caused considerable peptonization in milk, and in older cultures ammonia was formed. The volatile acids, acetic and propionic, were formed in the ratio of 7 to 1 for the strain examined.

Rancid flavour in Cheddar cheese, E. G. Hood and A. H. White (*Canada Dept. Agr. Bul. 146, n. ser. (1931), pp. 16*).—The grading of all cheeses by the Dominion of Canada Department of Agriculture during 1930 showed that 0.85 per cent of the cheese in Ontario and 1.4 per cent of the cheese in Quebec was

rancid or slightly rancid. The highest percentage of rancid cheese was graded in May and the lowest percentage in November.

The rancid flavors were produced in experimental cheeses by the addition of undesirable bacteria to the cheese milk. These bacteria had been isolated from poor quality milk, improperly sterilized equipment, poor starters, unpasteurized whey, bad water, and from factories lacking proper sanitation. Milk contaminated with manure, soil, dust, or feed may contain large numbers of butyric acid or rancid-producing bacteria. Most of the rancid cheeses were traced to factories receiving low-grade milk where sanitary conditions were poor, where equipment was not properly sterilized, or where the starter used was inactive and highly contaminated with molds, yeasts, and undesirable bacteria.

Adjustment of cheese to changes in outside air temperatures, F. H. McDowall (*Natl. Cheese Jour., 22 (1931), No. 12, p. 13, fig. 1*).—A study at the Massey Agricultural College, New Zealand, showed that it required a period of from 55 to 80 hours for the adjustment of the temperature of the body of an export Cheddar cheese, weighing 80 lbs., to a change in outside air temperature. The relation of this characteristic to the commercial handling of cheese is discussed.

Using dry and condensed skimmilk in manufacturing ice cream, C. A. Iverson, D. Calder, and C. C. Chu (*Ice Cream Trade Jour., 27 (1931), No. 7, pp. 27-29*).—The quality of ice cream as influenced by additional milk solids-not-fat from the same skim milk, concentrated by various methods, was studied. A mix of uniform composition made up of 14 per cent of fat, 9.7 per cent of milk solids, 15 per cent of sugar, and 0.3 per cent of gelatin was used in this work. The mixes were pasteurized and homogenized, and after freezing samples were placed in the hardening room for from 24 to 48 hours for judging for flavor, body, and texture.

The results showed that plain condensed skim milk, sweetened condensed skim milk, spray process dry skim milk, and roller process dry skim milk when fresh were apparently equal in value as sources of milk solids-not-fat where sweet cream and whole milk were used as sources of fat. The ice cream made with either roller or spray process dry skim milk, held 2 weeks or longer had a higher flavor score than ice cream made with condensed skim milk held over 2 weeks. Plain condensed skim milks of high or low concentrations were apparently equal in value for ice cream when fresh, but off flavors developed more rapidly in the low-concentrate products when the ice cream was held. When ice cream was made with unsalted butter, the flavor defects caused by various concentrated skim milk products were more apparent than when sweet cream was used. The amount of unsalted butter that could satisfactorily be used in ice cream manufacture was limited.

Effect of total time of freezing on the texture of ice cream, J. C. Hening (*Ice Cream Trade Jour., 27 (1931), No. 7, pp. 23, 24*).—In a study at the New York State Experiment Station five series of ice cream mixes were frozen in periods varying from 12.5 to 32.5 minutes. The mixes used contained 12 per cent of fat, 10 per cent of solids-not-fat, 0.5 per cent of gelatin, and 14 per cent of sugar. The mixes were pasteurized at 160° F. for 20 minutes and were homogenized with a two-stage homogenizer. The percentage of overrun and the temperature of drawing were kept as constant as possible.

The results indicate that the total freezing time was not an important factor in influencing the texture of ice cream when the drawing period was held uniformly cold.

Proceedings of the twenty-sixth annual meeting of the American Dairy Science Association (*Jour. Dairy Sci., 14 (1931), No. 6, pp. 540–550*).—A brief résumé of the meeting held at Berkeley and Davis, Calif., on July 13–15, 1931, together with the titles of papers presented (E. S. R. 65, p. 259).

Certified milk conferences held in 1931: Annual conference American Association of Medical Milk Commissions, Inc., and Certified Milk Producers' Association of America, Inc. . . . (*Amer. Assoc. Med. Milk Comms. [etc.] Proc., 25 (1931), pp. VIII + 334, figs. 7*).—This is a compilation of the proceedings of the twenty-fifth annual conference of the American Association of Medical Milk Commissions, held at Philadelphia, Pa., June 8 and 9, 1931, also the proceedings of the annual conference of the Metropolitan Certified Milk Producers, held in New York February 2, 1931 (E. S. R., 64, p. 472). Both meetings were held in conjunction with the meetings of the Certified Milk Producers' Association of America.

VETERINARY MEDICINE

The passage of fluids through the ruminant stomach, I. C. Ross (*Aust. Vet. Jour., 7 (1931), No. 4, pp. 122–134*).—Details are given of a number of experiments conducted in the course of which 140 animals were used. It was found that fluids passed much more regularly to the omasum and abomasum in sheep which had been allowed no water or food for 40 hours than in those allowed no water for shorter periods. The administration of certain mineral salts per se markedly influenced the passage of fluids to the abomasum instead of to the rumen and reticulum. Where water and food were withheld for 40 hours, the fluids were found to pass to the abomasum in at least 75 per cent of the cases irrespective of the nature of the solution given. When water was not withheld before administration, fluids passed to the abomasum in a minority of cases only, passing to the rumen and reticulum in the majority. It was found that smooth solid particles up to ⅜-in. in diameter will enter the omasum or abomasum when given in fluids which enter these divisions of the stomach directly.

Comparative germicidal tests of mercurochrome and tincture of iodin, R. A. Kelser and R. W. Mohri (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 1, pp. 87–95, fig. 1*).—The evidence obtained by the authors in the investigations here reported indicate that the commonly marketed 2 per cent solution of mercurochrome, 220 soluble, is not a satisfactory skin disinfectant for use in veterinary practice. Compared with tincture of iodine (U. S. P.), for such purpose, the latter proved distinctly superior. A concentration of 1 part of tincture of iodine (U. S. P.) in 10 parts of a suspension of tetanus spores killed the spores within 10 minutes. A similar concentration of mercurochrome (2 per cent aqueous solution) failed in this respect. Mercurochrome is decidedly ineffective as a germicide in the presence of blood, serum, tissue exudates, and possibly other protein substances. Such substances interfered much less with the bactericidal action of tincture of iodine. It is pointed out that the method here described for washing antiseptic-treated bacteria should prove valuable in eliminating most of the antiseptic without losing a large percentage of the organisms.

Poisoning of livestock by plants that produce hydrocyanic acid, J. F. Couch (*U. S. Dept. Agr. Leaflet 88 (1932), pp. 4*).—A practical account.

Diseases of livestock in Algeria [trans. title], A. Donatien and F. Lestoquard (*Arch. Inst. Pasteur Algérie, 9 (1931), No. 3, pp. 494–526*).—This is a summary of information on the more important diseases of domestic animals

in Algeria, arranged under the headings of bacterial diseases, diseases due to filtrable viruses, diseases due to protozoa, and parasitic diseases.

Serological study of a polyvalent antigen of Alcaligenes abortus (Bang), L. E. STARR (*Jour. Amer. Vet. Med. Assoc., 79 (1931), No. 6, pp. 798–802*).—An antigen with 8 per cent sodium chloride concentration was found to give the most satisfactory agglutination reactions. Unheated antigen stored at refrigerator temperature was more satisfactory than identical antigens stored at room temperature or antigens that had been heated. Incubations at 37 and 55° C. were equally satisfactory except that the reactions occurred a little earlier at 55°.

The diagnosis of Brucella infection in animals and man by rapid macroscopic agglutination, I. F. HUDDLESON (*Michigan Sta. Tech. Bul. 123 (1932), pp. 18, figs. 7*).—Two methods are described by the author for preparing rapid antigen for detecting specific agglutinins in the blood serum of animals and man due to infections from *B. melitensis*, *B. abortus*, and *B. suis*. The technic of preparing the rapid agglutination test and its interpretation is also presented. A list is given of 20 references to the literature.

A study of the Brucella infections observed in Tunis and Malta [trans. title], I. F. HUDDLESON (*Arch. Inst. Pasteur Tunis, 19 (1930), No. 4, pp. 391–421, figs. 3*).—An account is given of a study made by the author in Tunis and Malta during the summer of 1929 while acting as a representative of the U. S. Public Health Service.

Agglutinins in extracts prepared from the tissues of guinea pigs infected with Brucella abortus, W. M. and H. M. THOMPSON (*Jour. Amer. Vet. Med. Assoc., 79 (1931), No. 6, pp. 790–797*).—The authors were able to demonstrate agglutinins in one or more organs of guinea pigs infected with *B. abortus*, while other organs of the same animal examined by like or comparable methods failed to reveal their presence. It is concluded that agglutinin production is a local process in its relation to various organs of the body.

The prevention of Brucella abortus infection in guinea-pigs: The effect of convalescent and of hyperimmune serum, R. GWATKIN (*Jour. Infect. Diseases, 50 (1932), No. 2, pp. 111–118*).—The author found single injections of from 1 to 10 cc of fresh serum from cows infected with *B. abortus* to delay infection in guinea pigs. The same serum when 2 months old influenced the agglutinin titer to a lesser degree and also failed to protect. The effect of the serum was less marked in the group infected by injection than in those groups infected by mouth and by way of the conjunctival sac. Single injections of hyperimmune guinea pig serum in doses of 0.5, 1, and 2 cc produced a similar delay in the onset of infection, as indicated by the agglutinin titer. One of the five animals receiving the largest dose of serum was apparently uninfected at the close of the experiment, though there may have been a transitory infection, as indicated by a rise in titer from the fiftieth to the sixty-fourth day.

Single injections of 5 cc of fresh, hyperimmune guinea pig serum caused a delay in the production of agglutinins. One of the four guinea pigs in this group had a titer of 1:100 at the conclusion of the experiment, and the culture was negative. The others were clearly infected and had titers of 1:500 and 1:1,000. This animal had apparently received some degree of protection. The same serum after one month in the ice chest produced somewhat similar results. *B. abortus* was recovered from all in this group, but one sow gave birth to four normal young. Two of these died from a generalized infection due to *B. abortus*, and two remained uninfected. The mammary glands of this sow were uninfected at the conclusion of the experiment.

Five weekly injections of 2 cc of hyperimmune serum gave the best results in keeping down the agglutinin titer. Cultures from two animals were negative when this experiment was concluded. One of these was uninfected, but the other showed splenic lesions and *B. abortus* was recovered on culture.

The results of these experiments indicate that some immunity was conferred by these serums against infection by mouth and eye, as shown by delay in the appearance of agglutinins and by the protection of two of the principals by hyperimmune guinea pig serum. The fact that only one sow gave birth to young, while a number aborted, shows that the degree of protection was slight.

Foot-and-mouth disease and vesicular stomatitis, K. WAGENER (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 1, pp. 39–51*).—This account of a comparative study, presented at the annual meeting of the American Veterinary Medical Association, held at Kansas City, Mo., in August, 1931, is accompanied by a list of 22 references to the literature.

The etiology of "louping-ill": A review of the literature, W. A. POOL (*Vet. Jour., 87 (1931), Nos. 670, pp. 177–200; 671, pp. 222–239*).—This is a review presented in connection with a list of 46 references to the literature and preliminary to the work of Pool, Brownlee, and Wilson previously noted (E. S. R., 64, p. 560).

Second report on the Calmette-Guerin method of vaccinating animals against tuberculosis, W. E. COTTON and A. B. CRAWFORD (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 1, pp. 18–29*).—In this contribution the authors report having found the strain of B. C. G. which had been in their possession for seven years and cultured in accordance with the directions of A. Calmette to have been uniformly nonvirulent for guinea pigs. The investigations of B. C. G. vaccination of cattle here described corroborate the conclusions drawn from earlier investigations of Schroeder and Crawford (E. S. R., 61, p. 271) that B. C. G. vaccination, at best, merely inhibited the progress of tuberculous processes, and further show that the lesions of tuberculosis, once established in vaccinated animals, do not tend toward retrogression.

***Progress in controlling avian tuberculosis as indicated by effect on* hogs,** H. R. SMITH (*U. S. Egg and Poultry Mag., 38 (1932), No. 2, pp. 23–25, 62, figs. 3*).—This is a progress report by the livestock commissioner, Union Stock Yards, Chicago, Ill.

Intravenous infusion in the treatment of grass tetany and parturient paresis [trans. title], H. A. PULLES (*Tijdschr. Diergeneesk., 58 (1931), No. 24, pp. 1334–1342; Ger., Eng., Fr. abs., p. 1342*).—In the treatment of milk fever and grass tetany the intravenous injection of a solution consisting of calcium chloride (27 g), magnesium chloride (8 g), and water (250 g) gave excellent results. It is pointed out that the injection should be made slowly and stopped when the heart beat becomes irregular. A description is given of an apparatus invented by the author for use in administration.

Bovine mastitis caused by Pseudomonas aeruginosa, V. A. CHERRINGTON and E. M. GILDOW (*Jour. Amer. Vet. Med. Assoc., 79 (1931), No. 6, pp. 803–808*).—In work at the Idaho Experiment Station, *P. aeruginosa* was found to be the predominant cause of a persistent outbreak of mastitis in a dairy herd. "Mastitis caused by *P. aeruginosa* may be diagnosed by (1) isolation of the organism from the milk, (2) demonstration of an agglutination titer of 1:100 or over of the blood serum, or (3) demonstration of an agglutination titer of 1:50 or over of the milk serum. A definite relationship exists between the agglutination titers of the blood and milk sera in animals affected with mastitis caused by *P. aeruginosa*. Contamination of the water supply with

P. aeruginosa was responsible for recurrent cases of mastitis in the outbreak studied. The correction of the water supply prevented further development of mastitis caused by *P. aeruginosa*."

Discovery of the oesophageal stage larvae of Hypoderma lineatum Villiers in Indian cattle, P. G. MALKANI (*Indian Vet Jour., 8 (1932), No. 3, pp. 178–193, pl. 1*).—Larvae detected in the gullet, first parts of the stomach, and elsewhere in cattle in the Punjab were found by the author to be the immature stage of the common cattle grub.

Nairobi sheep disease, R. DAUBNEY and J. R. HUDSON (*Parasitology, 23 (1931), No. 4, pp. 507–524, figs. 6*).—The authors report upon investigations which have confirmed completely the findings of Montgomery (E. S. R., 37, p. 380) as to the existence of the specific filtrable virus disease known as Nairobi sheep disease. It is pointed out that while clinical features and post-mortem lesions should together be sufficient to arouse suspicion as to the nature of any outbreak occurring in a country where the tick vector *Rhipicephalus appendiculatus* is abundant, a diagnosis can finally be confirmed by the inoculation of susceptible sheep.

Posterior paralysis in a lamb due to hemorrhage in the spinal cord, L. P. DOYLE (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 1, p. 103*).—This contribution from the Indiana Experiment Station reports briefly upon the occurrence of paralysis in the hind parts of a 5-months-old purebred lamb which previously had been apparently healthy.

Controlling stomach worms in sheep and lambs, E. M. NIGHBERT (*U. S. Dept. Agr. Leaflet 89 (1932), pp. 6, figs. 5*).—A practical account.

Stomach worms in sheep and goats, W. T. HARDY and H. SCHMIDT (*Texas Sta. Bul. 448 (1932), pp. 16, fig. 1*).—A practical account of the stomach worm (*Haemonchus contortus*), which has caused heavy losses of sheep and goats in Texas, including its biology, effect upon the host, and control measures.

Post-vaccination problems in swine, H. HELL (*Jour. Amer. Vet. Med. Assoc., 79 (1931), No. 6, pp. 763–770*).—A general discussion of the subject.

The normal temperature, pulse, and respiration rates of Philippine horses, A. C. GONZAGA (*Philippine Agr., 19 (1930), No. 4, pp. 237–242*).—In studies of 105 animals in the Philippines, the details of which are presented in tabular form, the temperature was found to range from 37.4 to 38.4° C., which is not materially different from that reported from other climates. The pulse and respiration rates of Philippine horses were found to be much higher than the foreign standards, the pulse ranging from 38 to 50 and the respiration from 20 to 32 per minute.

Report of further work on the relation of Bact. abortus Bang to fistula and poll-evil of horses, C. P. FITCH, L. BISHOP, and W. L. BOYD (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 1, pp. 69–79*).—This is a report of further studies (E. S. R., 63, p. 76) at the Minnesota Experiment Station, the details of which are presented in tabular form. Agglutinins for *Bacterium abortus*, in a titer of 1:100 or above, were found in 48, or 76 per cent, of 61 samples of blood coming from horses affected with fistula and poll-evil. Seven cultures of *B. abortus* were isolated from samples of pus examined, or 22 per cent of the specimens examined for *B. abortus*. It is concluded that agglutinin titers of 1:100 or above are not positive evidence of the presence of an active disease in a horse, and that heating equine serum to 56° C. for 30 minutes does not materially alter the agglutinin content for *B. abortus* Bang. It appears that horses may maintain a constant titer of 1:100 or above to the Bang organism over a period of 2 years and show no evidence of disease.

It was found impossible to produce fistula and poll-evil in horses by artificial inoculation except when the organism was injected directly into the neck ligament.

Further investigations of Brucella infection in the horse [trans. title], J. VAN DER HOEDEN (*Tijdschr. Diergeneesk.*, *58* (*1931*), *No. 24*, *pp. 1321–1330*; *Ger.*, *Eng.*, *Fr. abs.*, *pp. 1329, 1330*).—In this contribution (E. S. R., 63, p. 371), the author reports that 14 of 15 horses with neck or throat abscesses and 2 of 6 horses with abscesses of the sternum gave positive serum reactions to *B. abortus*, as did all of 33 horses suffering from fistulous withers. All strains of the organism cultivated from horses were of the bovine type, with a strong tendency to mucus modification.

Corynebacterium equi in pneumonia in foals, W. W. DIMOCK and P. R. EDWARDS (*Jour. Amer. Vet. Med. Assoc.*, *79* (*1931*), *No. 6*, *pp. 809–812*).—This is a contribution from the Kentucky Experiment Station dealing with the subject under the headings of symptoms, gross pathology, morphological and cultural characters, pathogenicity, and serological reactions.

Studies on the treatment of equine surra in the Philippines, I, M. A. TUBANGUI (*Philippine Agr.*, *18* (*1930*), *No. 10*, *pp. 609–620*).—A method of treatment for surra, which the author has used with success in two cases of the disease, consists in the intravenous injection of trypanocidal drugs (tartar emetic and mercuric iodide) and in the oral administration of an anthelmintic (oil of chenopodium) for expelling whatever blood-sucking worms may be harbored by the animal affected with surra. Occasional removal of small amounts of cerebrospinal fluid during the treatment, either immediately before or after the administration of the trypanocidal agent, appeared to be beneficial. It is pointed out that during the treatment the animals should be allowed some form of light exercise and a liberal amount of nourishing food.

A study of intestinal parasites in horses and mules in Louisiana, with special reference to the control of colic, H. MORRIS (*Jour. Amer. Vet. Med. Assoc.*, *80* (*1932*), *No. 1*, *pp. 11–17*, *figs. 2*).—A study conducted at the Louisiana Experiment Stations indicated that colic in horses and mules may be practically eliminated from the average farm in the State by practicing parasite control. It is pointed out that in order to obtain desirable results all animals should be treated semiannually, and that in animals showing persistent colic treatment should be repeated within one month. A limited survey showed that the average horse and mule in the State harbored many species of internal parasites, 17 from the horse and 12 at least from the mule being noted.

Bacillary white diarrhea or pullorum disease of the fowl [trans. title], J. LAHAYE (*Ann. Méd. Vét.*, *76* (*1931*), *No. 12*, *pp. 497–519*).—In this contribution the author deals with prophylactic treatment by pullorination, preventive and curative medication, treatment with bacteriophage, and simple hygiene. In testing work with two different pullorins he has found a form prepared from an ordinary bouillon culture (pH 7.6), composed of 18 strains of the organism, held at 37° C. for a period of from 15 to 21 days and filtered through a Chamberland L_3 candle to be most reliable. In a comparative test on a flock of 100 fowls, 23 reacted positively to the tube agglutination test and 51 to the pullorin test.

A mixture of liquor ferric chloride 1 cc, quinine sulfate 6.25 g, potassium dichromate 31.21 g, and distilled water 2,000 g, added to the drinking water at the rate of 1 tablespoonful to 2 liters of water for chicks 3 to 10 days of age (or a day earlier if suspected of being infected) and 1 tablespoonful to 1 liter of water for older chicks, gave good results both as a preventive and as a remedial measure.

The dissociation of Salmonella pullorum and related species, W. L. Mallmann (*Michigan Sta. Tech. Bul. 122 (1932), pp. 40*).—The author's studies, the details of which are presented in tabular form, led to the recognition of three types of organisms as concerns colony stability found in the Salmonella group, namely, (1) the stable smooth type, (2) the stable rough type, and (3) the variable rough-smooth or intermediate type. Dissociation incitants were found to be without permanent effect upon pure rough and smooth type Salmonella organisms. Dissociation changes occurred only in the intermediate type cultures. Single celled cultures behaved, under the influence of dissociating agents, exactly the same as the pure line strains. The data obtained are said to indicate that the colony types studied are of a hereditary nature and not merely environmental.

A list is given of 41 references to the literature.

Variants of Salmonella pullorum, W. N. Plastridge and L. F. Rettger (*Jour. Infect. Diseases, 50 (1932), No. 2, pp. 146–161, figs. 12*).—In studies at the Connecticut Storrs Experiment Station extracts of the livers and the intestinal contents of adult birds surviving an acute attack of disease due to infection with *S. pullorum* were found to contain a bacteriophage that was active against the cells of *S. pullorum* in dilutions up to and including 1×10^{-10}. In the presence of this active principle, cells of *S. pullorum* in most instances were lysed or became phage resistant, and in the other instances the development of the cells appeared to parallel the action of the bacteriophage. Under the last-named condition, cells of *S. pullorum* were inagglutinable by antiserum for the ordinary *S. pullorum*. Three principal types of colonies were observed on beef infusion and liver infusion agars inoculated with the mixtures of phage and culture: Namely, S1 or ordinary smooth colonies of *S. pullorum*, S2 colonies that were smooth in appearance, but much larger than S1 colonies, and R colonies that possessed distinctly roughened surfaces. Colonies developing on ordinary nutrient agar inoculated with cells from R colonies showed only a slight tendency toward roughness. The morphology, agglutinability, and colonial characteristics of substrains of these three types of colonies are discussed.

Bacteria of the enteric group in poultry, C. A. McGaughey (*Vet. Jour., 88 (1932), No. 1, pp. 16–26*).—The author first considers infections of poultry with bacteria of the enteric group other than *B[acterium] pullorum* and *B. gallinarum*. He then reports upon six strains of bacteria isolated from chicks and adult fowls in six separate infections and resembling the organisms isolated from man by H. de R. Morgan in 1907 and H. de R. Morgan and J. C. G. Ledingham in 1909. Two of the six strains were isolated in pure culture from the blood, organs, and intestines of young chicks with clinical signs of bacillary white diarrhea; the remaining four from the blood, organs, or intestines of adult fowls.

Agglutination tests have shown that there was little antigenic relationship between the six strains. The pathogenicity of the six strains is discussed, and it is suggested that in four of the cases described the organism isolated was the cause of disease. Five instances of infection with bacteria of the Salmonella group are described. In two instances, one an outbreak in young chicks showing clinical signs of bacillary white diarrhea and the other a chronic disease in ducks, an organism which by cultural and serological tests seemed to be identical with, or at least closely related to, *B[acillus] enteritidis* (Gaert.) was isolated. In one case, a nonmotile Salmonella organism, which by cultural and serological tests seemed to be related to *B. aertrycke*, was isolated.

A haemoglobinophilic bacterium as the cause of contagious catarrh of the fowl, coryza infectiosa gallinarum, L. de Blieck (*Vet. Jour., 88 (1932),

No. 1, pp. 9–13).—Under the name *Bacillus haemoglobinophilus coryza gallinarum*, the author describes an organism which he has found to be the cause of contagious catarrh of poultry in the Netherlands.

The persistence of Pasteurella avicida in the blood and organs of fowls with spontaneous fowl cholera, J. M. Hendrickson and K. F. Hilbert (*Jour. Infect. Diseases, 50* (*1932*), *No. 2, pp. 89–97*).—The authors found that *P. avicida* may be present in the blood stream of naturally infected birds for a period of at least 49 days preceding death. It was not present in the nasal cleft and upper part of the trachea of naturally infected birds with any degree of constancy. "A rapid multiplication of *P. avicida* occurs in the blood stream and tissues of the bird immediately preceding and following death. *P. avicida* remains viable in the tissues of the carcass for at least 11 days at the temperature of the room and for at least 2 months at that of the ice box. *P. avicida* retains its pathogenicity when held in the carcass for a period of 2 months at ice box temperature. Birds exposed to, and infected with, fowl cholera develop agglutinins measurable only in low dilutions of serum."

So-called "fowl paralysis," also called neuritis in chickens, range paralysis, neuro-lymphomatosis gallinarum, G. H. Warrack and T. Dalling (*Vet. Jour., 88* (*1932*), *No. 1, pp. 28–43*).—A discussion is given on the various theories as to causation, with special reference to field observations and laboratory transmission experiments.

"Fowl paralysis exists as a specific disease and can be diagnosed by a study of clinical symptoms, post-mortem lesions, and histological sections of various tissues, including the brain and spinal cord. It is more readily diagnosed as an outbreak than by the examination of a single affected bird. The disease can be transmitted to healthy birds by the injection of suitable sterile tissues from affected cases. The disease may exist without the presence of intestinal parasites, including coccidia, and can be reproduced in birds which have never been exposed to such parasitic infestation. It seems probable that intestinal parasites, errors in feeding and inbreeding, predispose to the production of symptoms. In the absence of the causal factor (at present unknown, but contained in tissues of affected birds) they are incapable of causing evidence of true fowl paralysis. It seems practically certain that the disease may be transmitted through the egg, and that the cockerel as well as the hen may be the transmitter. There is some evidence to show that transmission by contact between diseased and healthy birds may occur. The hypothesis that the cause of the disease is a filtrable virus is consistent with our results."

Fowl pest transmission experiments with Aedes aegypti [trans. title], O. Nieschulz, A. Bos, and Tarip (*Zentbl. Bakt.* [*etc.*], *1. Abt., Orig., 121* (*1931*), *No. 7–8, pp. 413–420*).—The authors conclude from experiments conducted in which mosquitos taken after feeding on infected fowls were tested, 35 for direct transmission to normal fowls and 92 for transmission 3 and 5 days after feeding, that the yellow-fever mosquito does not transmit fowl pest.

Parasites injurious to poultry, L. Stevenson (*Ontario Dept. Agr. Bul. 363* (*1931*), *pp. 18, figs. 18*).—This is a practical account.

Pigeon-pox in Michigan, H. J. Stafseth (*Jour. Amer. Vet. Med. Assoc., 79* (*1931*), *No. 6, p. 822*).—This is a report of the occurrence of pigeon pox in a flock in Michigan, which is said to be the first outbreak to come to the author's attention in the United States.

A distemper-like disease of the fox, J. R. Cunningham (*Vet. Rec., 12* (*1932*), *No. 6, pp. 141–144*).—The author describes a distemperlike disease that affects foxes in the Province of Prince Edward Island, Canada, where in certain districts it has assumed alarming epizootic proportions but has not spread to

the dog population. It has been found that foxes can be immunized against it by a vaccine prepared according to the method of Laidlaw and Dunkin for dog distemper (E. S. R., 59, p. 676). The serum prepared from recovered animals was found to have curative properties, suggesting the possibility of preparing a hyperimmune serum for the disease similar to that prepared for canine distemper.

Anatomy and pathology of the spontaneous diseases of small laboratory animals, edited by R. JAFFÉ (*Anatomie und Pathologie der Spontanerkrankungen der Kleinen Laboratoriumstiere. Berlin: Julius Springer, 1931, pp. XIX+832, figs. 270*).—This work, in the preparation of which 28 authors collaborated, deals with four important laboratory animals, namely, the rabbit, guinea pig, rat, and mouse. The first or special part (pp. 1–564) takes up the normal structure and pathological anatomy of the different organs of the body. In the general part (pp. 565–814) the bacterial and parasitic diseases, glycogen metabolism, and tumors are treated. The work aims at aiding investigators who in their experimental work must know that they are working with animals that are normal in every respect.

AGRICULTURAL ENGINEERING

A practical handbook of water supply, F. DIXEY (*London: Thomas Murby & Co., 1931, pp. XXVIII+571, figs. [140]*).—This handbook deals with the improvement of the water supplies of European and native settlements in Africa. The geological aspects of water supply are described in some detail, particularly as regards the crystalline rocks. The practical aspect of retaining or recovering water is treated mainly from the point of view of settlers, missionaries, and others who are faced with the necessity of developing small water supplies although inexperienced in such work. Accordingly, methods of dam construction and of sinking wells and boreholes to moderate depths are described in detail. Information is given also on deepening and increasing the yield of wells. The technic of deep boring is described only in sufficient detail as to afford some insight into the nature of the work and its problems.

The various means of purifying water and of protecting water sources from contamination are fully described, and a chapter also is devoted to means employed for detecting underground water supplies.

The final chapter describes in brief outline the water supply conditions, as far as they are known at present, of the contiguous British dependencies of southern, central, and eastern Africa.

Surface water supply of the United States, 1928, II (*U. S. Geol. Survey, Water-Supply Paper 662 (1932), pp. V+129, fig. 1*).—This report, prepared in cooperation with the States of Virginia and North Carolina, presents the measurements of flow made on streams in the South Atlantic slope and eastern Gulf of Mexico drainage basins during the year ended September 30, 1928.

Surface water supply of the United States, 1929, II, V, VIII, X (*U. S. Geol. Survey, Water-Supply Papers 682 (1932), pp. VI+178, fig. 1; 685 (1932), pp. V+147, fig. 1; 688 (1932), pp. V+131, fig. 1; 690 (1932), pp. V+86, fig. 1*).—Of the papers which here present the results of measurements of flow made on streams during the year ended September 30, 1929, No. 682, prepared in cooperation with the States of Virginia and North Carolina, covers the South Atlantic slope and eastern Gulf of Mexico basins; No. 685, prepared in cooperation with the States of North Dakota, Minnesota, Wisconsin, Illinois, and Missouri, covers the Hudson Bay and upper Mississippi River basins; No. 688,

prepared in cooperation with the State of Texas, covers the western Gulf of Mexico basins; and No. 690, prepared in cooperation with the States of Utah, Nevada, California, Oregon, and Wyoming, covers the Great Basin.

Surface water supply of the United States, 1930, Parts 4, 8, 9, 12A (*U. S. Geol. Survey. Water-Supply Papers 699 (1932), pp. V+125, fig. 1; 703 (1932), pp. V+131, fig. 1; 704 (1932), pp. V+117, fig. 1; 707 (1932), pp. VII+196, fig. 1*).—Of the papers which here present the results of measurements of flow made on streams during the year ended September 30, 1930, No. 699, prepared in cooperation with the States of Wisconsin, Illinois, Ohio, New York, and Vermont, covers the St. Lawrence River Basin; No. 703, prepared in cooperation with the State of Texas, covers the western Gulf of Mexico basins; No. 704, prepared in cooperation with the States of Wyoming, Utah, and Arizona, covers the Colorado River Basin; and No. 707, prepared in cooperation with the States of Washington, Montana, and Idaho, covers the Pacific slope basins in Washington and upper Columbia River Basin.

Cost of pumping for irrigation in Colorado, W. E. CODE (*Colorado Sta. Bul. 387 (1932), pp. 31, figs. 12*).—This bulletin reports data on the cost of pumping water for irrigation, obtained from a study covering a period of two years under conditions that were representative of practice in the northern and southern parts of Colorado. In addition, data are reported on plant performance and cost of power resulting from tests made on plants in various pumping districts.

The results indicate that the ideal pumping plant is one which is of the correct capacity for the area involved and operating with a good load factor. The larger the area that can be served by a single plant the lower are the unit costs, and, conversely, these increase as the area decreases until a point is reached where certain component parts of the plant can not be economically reduced, causing a rapid rise in the unit costs.

It was found that water can be produced cheaply by a Diesel engine plant, provided the load factor is good, although it requires full-time attendance. The total cost per acre-foot-foot may be as low as 10 cts. with such a plant, whereas with a poor load factor the unit cost may exceed four times the cost for a gasoline engine. Between these limits were found the distillate engine plants with a probable cost of about 15 cts. and the better class of gasoline engine plants at about 25 cts.

From the data obtained in this study and those obtained by tests on other plants, a fuel consumption per acre-foot-foot for various types of engines is approximately as follows: Diesel 0.25 gal., semi-Diesel 0.30 to 0.35 gal., electric ignition with distillate 0.35 to 0.40 gal., and for gasoline engines 0.35 to 0.50 gal. The amount of fuel consumed will depend on the efficiency of the engine and the pump.

The importance of high load factor as regards engines applies with equal significance to electric motor-driven pumps operating on a sliding scale rate.

The average cost per kilowatt-hour in the northern study was 2.87 cts. and 3.3 cts. in the southern study. The studies also showed that the total cost of water per acre under canals ranged between $5.37 and $11.41, with an average of $8.13. For engine-driven plants, the total cost per acre varied between $6.85 and $17.56, the average being $12.48, with the pumping lifts varying from 20.4 to 78 ft. The total cost per acre for the electric plants varied between $4.66 and $13.85, with an average of $9.76 for lifts between 22 and 46 ft. The studies indicate that the total lift for pumping plants should not exceed 40 ft.

Strength-moisture relations for wood, T. R. C. Wilson (*U. S. Dept. Agr., Tech. Bul. 282 (1932), pp. 88, figs. 44*).—The purpose of this bulletin is to discuss the relations between the moisture content and the strength properties of small, clear specimens of wood, to outline the development of formulas that may be used in adjusting strength values for differences in moisture content, and to make clear the applicability and limitations of these formulas. Other phases of moisture-strength relations are also discussed.

Data are reported resulting from tests of the effect of moisture on the strength properties of wood as made by the Forest Service over a period of 25 years. From them a type formula is derived to express the relation between uniformly distributed moisture content and various strength properties.

Preservation of Indian timbers—the open tank process, F. J. Popham (*[Indian] Forest Bul. 75 (1931), pp. [3]+12+[5], figs. 6*).—Practical information is given on the preservation of Indian timbers by the open tank process. The process is described and is illustrated in an appendix, and second and third appendixes give lists of species which can not be treated in the heartwood and which can be treated throughout by the open tank process.

Knock rating of straight-run Pennsylvania gasoline in relation to boiling point, density, and index of refraction, M. R. Fenske (*Indus. and Engin. Chem., 22 (1930), No. 8, p. 913*).—This is a brief preliminary report of studies in progress at the Pennsylvania State College, the object of which is to fractionate Pennsylvania straight-run gasoline more thoroughly than has been done. Typical fractions were tested for knock characteristics by the bouncing-pin method. In some instances where several fractions were taken at the same temperature remarkable variations in density, refractive index, and knock rating were obtained. In general, the fractions having the lowest densities and refractive indexes had the highest ratings, and vice versa.

Improved paraffin-base lubricating oils, G. H. B. Davis and A. J. Blackwood (*Indus. and Engin. Chem., 23 (1931), No. 12, pp. 1452–1458, figs. 6*).—A study of dewaxing paraffin-base oils indicates that, in order to obtain the advantages of low-pour oils (pumpability and quick distribution at low temperature) by this method, it is necessary to degrade the oil to some extent in most of its other characteristics, namely, (1) decrease the viscosity index of the oil with resultant increase in difficulty of starting, (2) increase the carbon-forming tendency of the oil by removal of the wax, (3) increase the volatility of the oil, which causes increased oil consumption in the engine, (4) decrease the lubricating characteristics of the oil as indicated by lessened load-carrying ability and "oiliness," and (5) decrease oxidation stability with consequent sludging in the engine and other deleterious effects.

It has been found that by the use of small quantities of a pure hydrocarbon lubricant it is possible to reduce the pour point of paraffin-base oils and to obtain the advantage of low-pour oils without impairing the other desirable characteristics of the oils.

Exhaustive tests show that the low-pour oil thus produced is entirely stable, has no unexpected or unusual effect upon the engine, and is somewhat superior to the original oil with regard to lubricating characteristics.

The safe use and storage of gasoline and kerosene on the farm (*U. S. Dept. Agr., Farmers' Bul. 1678 (1932, pp. II+14, figs. 10)*).—This was prepared by the chemical engineering division of the Bureau of Chemistry and Soils, in cooperation with the Bureaus of Agricultural Engineering and Agricultural Economics and the National Fire Protection Association. It points out the most common hazards in connection with the use of gasoline and kerosene on farms and outlines the precautions which should be observed.

Information also is given on how to extinguish gasoline and kerosene fire. It is pointed out that petroleum and its products rank sixth in order of importance as a cause of fires on farms, and is responsible for almost 7.5 per cent of the total farm fire loss.

A progress report of investigations of the various uses of electricity on the farms of Washington for the year 1931, L. H. SMITH and H. L. GARVER ([*Pullman*]: *Wash. Com. Relat. Elect. Agr., 1932, pp. 33, pls. 12*).—This is the seventh annual progress report of the Washington State Committee on the Relation of Electricity to Agriculture. It contains data from studies of the influence of ultra-violet light on milk production, on the use of carbon lamp brooders, grain elevating, irrigation of orchards by sprinkling, evaporation, apple washing, and soil heating.

The tests on irradiation of cows and of cow feed did not show any effect either in weight changes or in the general appearance of the cow. The results indicate that the irradiation of the feed offers the most promise.

In the grain elevating tests it was found that the power requirements of the pneumatic type of elevator were not excessive. While the power required for the blower was more than twice that required for the cup or drag type of elevator when handling the same amount of grain, the actual cost of electricity was but a small percentage of the total cost of handling the grain.

The results of observations over two seasons of orchard irrigation with sprinklers indicated that the greatest problem connected with their operation is the elimination of floating trash. It was found that particles heavier than water will settle out quite readily if sufficient settling box space is provided. The most trouble is caused by woody materials impregnated with sand or mud which have about the same specific gravity as water.

Tests of the evaporation from orchard irrigation sprinklers showed that there is no close correlation between any of the factors influencing evaporation taking place. There was no more loss from sprinklers which broke the water into a fine spray than from those which spread it in large drops.

Report on the activities of the Institute for Agricultural Machinery [trans. title], [C. T.] DENCKER, WRIEDE, SEGLER, and DIENST (*Jahresber. Preuss. Landw. Vers. u. Forschungsanst. Landsberg, a. d. Warthe, 1930–31, pp. 98–107*).—A brief summary is given of the program of investigation conducted by the institute on hay and straw blowers, cultivating machinery, potato harvesting machinery, and the use of electricity in agriculture. A list of 15 published reports of studies on these machines, mostly by the senior author, is included together with a list of unpublished reports.

Draft eveners and multiple hitching [trans. title], C. W. ABERS (*Technik Landw., 12 (1931), No. 12, pp. 302–305, figs. 15*).—Different eveners and methods of multiple hitching are described and illustrated.

A method of comparing plow bottom shapes, W. ASHBY (*Agr. Engin., 12 (1931), No. 11, pp. 411, 412, figs. 6*).—In a contribution from the U. S. D. A. Bureau of Agricultural Engineering, a method of comparing the design and performance of plow bottom shapes is presented which is based on studies of some 40 different styles of plow bottoms produced by leading plow manufacturers. These ranged in size from 12 to 18 in., and most of them were classed as general-purpose bottoms. Field tests of their ability to cover cornstalks and their power requirements showed that shape of the plow bottom is a factor in both covering ability and draft.

The method developed expresses the relationship between shape, covering ability, and draft as a result of measuring each factor and expressing it numerically. The standard measurements of plow bottom shape adopted were

projected length of shin, height of shin, height at midsection, depth at midsection, width at waist, width at lower corner of wing of mold, and height at lower corner of wing of mold.

Graphic data are presented of measurements of these values on 65 plow bottoms of different makes and shapes, indicating that a series of plows of one make and intended for the same soil conditions are not duplicates on different scales. It also was found that the depth factor increases as the width of cut increases from 0 to 12 in., but remains practically constant through the size range beyond 12 in.

A correlation study of the relationship between field performance and shape characteristics resulted in the development of two special factors known as the upper standard contour and the lower standard contour. Tests of the usefulness of the measurements of the various factors showed that the most important are width at waist, width at the crossing of the standard contours, the combination width minus height at the lower corner of the wing of the mold, the ratio of height to depth at the midsection, and the upper standard angle.

The treatment of plowshares by farm smiths [trans. title], W. Kloth (*Technik Landw., 12 (1931), No. 12, pp. 310, 311, figs. 5*).—Tests of 100 different plowshares conducted by the Agricultural Academy of Berlin showed defective heat treatment and working of the cutting edges in a majority. Hardness defects were especially evident, and suggestions for improving this situation are given.

Investigations of the agronomic basis for mechanical single kernel seeding and broadcasting of grain [trans. title], W. Heuser (*Technik Landw., 12 (1931), No. 12, pp. 305–307*).—Experiments on the planting of rye by drill, by broadcasting, and by single kernel seeding, uniformly spaced, are reported.

Single kernel seeding spaced 2.5 cm (1 in.) apart resulted in the best yield and the best utilization of a controlled amount of nitrogen fertilizer. Since the drill moved at the rate of 1 meter per second it would be necessary for it to drop the seed grain at the rate of 40 per second at 1-in. intervals in order to meet this requirement.

The regulation of drilling depth [trans. title], H. Schwarz (*Technik Landw., 12 (1931), No. 11, pp. 292, 293, figs. 3*).—Experiments conducted at the University of Breslau on the regulation of drill shares in small grain planting are briefly reported.

It was found that the relative penetration of a share is somewhat independent of the strength and thickness of the share point, as this factor may be influenced by weighting for almost any type of point. However, the nonuniformity of penetration increased as the depth of penetration increased.

The saber type of share was found to penetrate less and more uniformly than other types, owing to its long cutting edge, and was especially useful in these respects in soils of nonuniform looseness and resistance to penetration. Under these conditions share performance improved as the shape varied from that of the normal share and approached that of the saber share. In this connection the best results in depth regulation were secured by the use of an auxiliary drill sled bolted to the front of a saber share and adjustable vertically.

Mower investigations [trans. title], W. Kloth (*Technik Landw., 12 (1931), No. 8, pp. 232–235, figs. 4*).—Experiments conducted at the Agricultural Academy of Berlin are reported. The results are taken to indicate that the value of oil bath construction for mowing machines in agricultural use has been overestimated, and that these machines in such use do not have an especially high

efficiency. Doubt is cast on the justification for the higher price of these machines, especially when the short period of annual use is considered.

Construction of sled-type cornstalk shavers, F. Irons, S. W. McBirney, and R. M. Merrill (*U. S. Dept. Agr., Misc. Pub. 142 (1932), pp. 16, figs. 34*).—Practical information is given on the construction of two kinds of sled-type cornstalk shavers, on the cost of building a stalk shaver, and on operating adjustments.

The behavior of different kinds of grain in grinding [trans. title], E. Schilling (*Technik Landw., 12 (1931), No. 12, pp. 308–310, figs. 4*).—Experiments on the grinding of winter and summer barley, rye, wheat, oats, peas, and beans are reported. The results indicate that the distribution of particle sizes in the ground product will vary widely for different grains ground in the same mill. This appears also to hold for feeding value and power required for grinding.

It was found that the effective production of bran by a feed mill will vary as much as 200 per cent with different grains. This is due not only to the variable power requirement but also to the fact that the construction of the grinding elements has an influence. This was especially true when grinding oats, it being found that some grinding elements are not adapted to oats grinding.

New developments in machinery for processing animal feeds, F. J. Bullock and F. H. Hamlin (*Agr. Engin., 12 (1931), No. 12, pp. 431–434, figs. 4*).—This is a review of recent developments in feed-processing machinery, made from the viewpoint of the machine manufacturer.

A new testing process for determining the efficiencies of cream separators [trans. title], W. Fritz (*Technik Landw., 12 (1931), No. 11, pp. 284–286, figs. 8*).—As the result of experiments with milk with varying cream lines, a new method for determining the efficiencies of cream separators is derived which eliminates the error due to the variable cream lines of different milks by expressing separating efficiency on the basis of the limiting diameter of the fat globules which will separate.

Research in farm structures, H. Giese (*U. S. Dept. Agr., Misc. Pub. 133 (1932), pp. 52, figs. 12*).—This report presents the results of a study of the current situation in respect to farm-structures research, including some conclusions and recommendations for a plan of action. It is pointed out that although a number of institutions are now doing excellent work in the field of farm structures, the total effort is relatively small and not commensurate with the importance of the problems. This is considered to be due to a passive interest, personnel problems, and lack of nation-wide correlation of effort.

It was found that few, if any, of the farm-structures problems are strictly local in importance or application. On the contrary, factors which necessitate variations in housing are regional, and there are numerous problems the solution of which would have national application. The farm dwelling and the dairy-housing problems are recommended for first consideration.

Appendixes are included on an outline for a cooperative research project, a general outline for a research project, State division of funds for agricultural engineering research, and the distribution of funds and personnel for agricultural engineering research. A bibliography of 86 references is also included.

Agricultural structures in Belgium and the Belgian Congo, E. Leplae (*Les Constructions des Exploitations Agricoles en Belgique et au Congo Belge. Louvain: Libr. Univ., 1931, pp. [4]+192, pls. 4, figs. 159*).—This is an extensive description of farm buildings and structures and their arrangement as used

in Belgium and in the Belgian Congo. Information also is given on the arrangement of farm homesteads. Numerous diagrammatic and other illustrations are included.

Present trends in dairy management methods and structures, J. D. Long (*Agr. Engin., 12 (1931), No. 11, pp. 399–405, figs. 13*).—In this contribution from the California Experiment Station, a critical review is given of present practice in the design of dairy structures, it being pointed out that this practice is dependent on management methods and the equipment used. It has been found that separate milking and housing facilities have proved successful over a period of years, and their use is increasing. The chief advantages are increased animal comfort, greater convenience, more efficient use of equipment, water, artificial lighting, and labor, increased sanitation, and improved quality of product.

Length and floor construction of dairy stalls, H. Giese and C. Y. Cannon (*Iowa Sta. Research Bul. 150 (1932), pp. 185–209, figs. 27*).—Studies of the length of stall platforms for dairy barns led to the conclusion that the designation of breeds is relatively unimportant in the determination of stall size for a dairy cow. This does not hold true for beef or dual-purpose cattle since they are much heavier in proportion to their length.

Stall length may be estimated from either the weight or length of the cow, the length being more reliable but somewhat less easily obtained. An estimate of stall length made from either the cow's length or weight is fairly close and easily obtained. The formulas derived are

$$Ls'=Lc-1.5 \text{ and } Ls''=\frac{Wc}{50}+36.5,$$

in which L is length and W is weight.

Studies of dairy stall flooring materials showed that the wear on Portland cement concrete and rubber paving blocks was so slight as to be almost negligible. It was found that asphalt as a base for wood blocks flows under continuous pressure, even when it is cold and apparently hard. Cork brick lasted fairly well when laid in Portland cement mortar and when mortar was used in the spaces between the bricks so that their edges were protected. Mastic floors proved undesirable owing to the tendency of asphalt to flow under pressure and to the concentrated application of loads in dairy stalls.

A special profilometer and a modified pantograph constructed for the profile measurements reported are described.

Small plants for pasteurizing milk, F. M. Grant and C. E. Clement (*U. S. Dept. Agr. Circ., 214 (1932), pp. 23, figs. 10*).—The results of studies of the construction, equipment, and arrangement of more than 125 small pasteurizing plants are presented in this circular, with an analysis of the findings and recommendations on the placing, building, and equipment of small pasteurizing plants.

Refrigeration in the handling, processing, and storing of milk and milk products, J. T. Bowen (*U. S. Dept. Agr., Misc. Pub. 138 (1932), pp. 59, figs. 32*).—This publication discusses the various applications of refrigeration in the operation of modern dairy plants and the methods most commonly used in the latest and best-equipped plants. It is prepared for the information of those engaged in the dairy industry and for manufacturers of refrigerating machinery. It contains sections on mechanical refrigeration, insulation, methods of utilizing refrigeration, physical properties of milk and milk products in relation to cooling, relation of temperature to bacterial and chemical changes in milk, seasonal variation in milk production, uses of refrigeration in the dairy industry, ice cream plants, solid carbon dioxide, and brine ice.

AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY

Research in agricultural land utilization: Scope and method, edited by J. D. BLACK (*Social Sci. Research Council Bul. 2 (1931), pp. [2]+201, pl. 1*).—This is the second report of the series previously noted (E. S. R., 65, p. 388). It was prepared by a special committee composed of J. D. Black, L. C. Gray, I. G. Davis, L. M. Vaughan, and G. S. Wehrwein. Contributions from 24 research workers connected with the U. S. Department of Agriculture, State universities, other universities, agricultural colleges and experiment stations, and other institutions are included. The specific ends in view were "to mark off this field of agricultural economics research, indicate its interrelations with other fields of research, outline its content, describe the research projects already undertaken in this field, and evaluate the methodology employed in projects completed or under way, and suggest methods and procedures that may be used to advantage in different types of projects both old and new."

Twenty of the projects analyzed involve a description and explanation of the land utilization of an area. Ten of these have for their objectives the description of the physical and natural conditions so far as significant for land utilization and to show the relation of certain of these factors to land utilization, and 10 are concerned with the description of the economic and social factors related to land utilization and the explanation of the nature of these relationships. Ten of the projects involve the forecasting of the most advantageous uses of land. For four projects the analysis is principally in terms of forest uses of land. Three other projects deal with a plan for an area in relation to desirable modifications in land utilization; the forecasting of the effect of future changes in economic and other social conditions in the world, and more especially in the United States, upon the utilization of the Nation's land supply; and the determination of the economic importance of erosion in a particular area and the feasibility of its control.

Some suggestions are made for projects directed specifically at developing land utilization theory.

Land utilization in Laurel County, Ky., C. F. CLAYTON and W. D. NICHOLLS (*U. S. Dept. Agr., Tech. Bul. 289 (1932), pp. 100, pl. 1, figs. 8*).—This bulletin reports the results of a study made in cooperation with the Kentucky Experiment Station, the principal objectives of which were "(1) to determine the present major uses of the land, that is, whether for crops, pasture, or woodland; (2) to relate the present utilization of the land to basic physical conditions for the areas studied, and to generalize these relationships, as far as possible, to the county as a whole; (3) to trace the relationship between the physical characteristics of land and (*a*) the distribution of land among various uses, (*b*) the size of the farm business, (*c*) the amount and sources of farm and other income, (*d*) the sources and value of the family living, and (*e*) the composition and characteristics of the population; and (4) to outline on the basis of the foregoing analysis a land-utilization program designed to secure the optimum adjustments of the mode of living and of the social and economic institutions of the area." The study covers 8 school districts with an acreage of 17,642 acres, distributed among 277 farms.

The important conditions that have affected the economic and social developments of the area, the general conditions, climate, soils, drainage, etc., of the county, the major uses of the land in different sections of the county, and the physical characteristics of the crop and pasture lands are described. The utilization of land for crops and pasture and of woodland, including yields and costs; the relation of size of farms and geological formations, size of farms and

land characteristics, and size of farms and land characteristics to farm income; and the relation of land characteristics to (1) value of crop land, (2) sources and value of family living, and (3) population and population changes are analyzed. The community conditions and problems are discussed, and suggestions and recommendations made for a general land utilization policy and for adjustments in farm economy, forest economy, population, and public policy.

Special aspects of the study have been treated in more detail in bulletins of the Kentucky Experiment Station previously noted (E. S. R., 64, pp. 84, 90).

Farm practices that pay, H. C. M. Case and M. L. Mosher (*Illinois Sta. Circ. 389 (1932), pp. 39, figs. 9*).—The most important of the farm practices contributing to financial success are discussed and illustrated from findings of the station in its cost of production, special farm operations, farm power, livestock enterprise, and farm financial record studies, and the farm bureau farm management service records.

Farm-management problems in shifting from sack to bulk handling of grain in the Pacific Northwest, N. W. Johnson, E. F. Landerholm, G. W. Kuhlman, and T. L. Gaston (*U. S. Dept. Agr., Tech. Bul. 287 (1932), pp. 40, figs. 30*).—This study was made by the Bureau of Agricultural Economics in cooperation with the Washington, Oregon, and Idaho Experiment Stations to determine the relative economy of harvesting and handling grain by sack and by bulk methods. Data were obtained during the summer of 1930 from 316 grain growers in eastern Oregon and Washington, and northern Idaho. The costs of man labor and hauling, sources of harvesting losses and delays in harvesting, the labor requirements in loading cars with the two methods, the cost of operation of equipment in bulk handling directly to shipping point and for farm storage, the types and costs of bulk-handling equipment, the feasibility of farm storage of bulk grain, hauling direct from farm to car, and the retarding influences in shifting from sack to bulk handling are described.

Adjusting Corn Belt farming to meet corn-borer conditions, K. H. Myers (*U. S. Dept. Agr., Farmers' Bul. 1681 (1932), pp. II+26, figs. 12*).—In this practical account, applicable to the Corn Belt area, covering all or parts of the 11 North Central States, the importance of corn in the organization of Corn Belt farms is first considered, followed by accounts of the supply of cash crops grown in the Corn Belt in relation to consumption requirements, the possible effect of corn borer infestation on farm organization, control of the corn borer, adjustments for corn borer control, and factors affecting cost of control.

An economic study of the agriculture of the Connecticut Valley.—IV, A history of tobacco production in New England, C. I. Hendrickson (*Connecticut Storrs Sta. Bul. 174 (1931), pp. 65, figs. 12*).—This bulletin is the fourth in the series previously noted (E. S. R., 64, p. 275). The growth and changes in tobacco production in New England are described under the headings of tobacco production in colonial New England, the expansion of tobacco production (1840–1880), the concentration of tobacco acreage in the Connecticut Valley, and the World War and the decrease in cigar consumption. The production, market factors, changes in agricultural science and technic, the natural environment, and the price changes affecting the production of, demand for, and consumption of New England tobacco are summarized. A bibliography is included.

A survey of Iowa's poultry industry, W. D. Termohlen and P. L. Miller (*Iowa Sta. Circ. 133 (1931), pp. 32, figs. 17*).—Tables, charts, and maps are included and discussed showing the growth and present status of the poultry

industry in Iowa, the types of commercial agencies assembling and distributing poultry products, and the markets for the commercial supply of such products. The problems of producers and distributors are discussed briefly.

Essentials in the success of a local cooperative creamery, T. M. OLSON and C. C. TOTMAN (*South Dakota Sta. Bul. 266 (1931), pp. 24, fig. 1*).—Some of the features upon which the success or failure of cooperative creameries depends are discussed. Included are an outline of the procedure in organizing a local cooperative creamery, a list of equipment needed by a creamery making from 200,000 to 400,000 lbs. of butter annually, and a suggested form of bylaws for cooperative creameries.

Cost of production of cotton and corn (*Louisiana Stas., North Louisiana Sta. Rpt. 1931, pp. 28, 29*).—Itemized cost data for growing and ginning 9.5 acres of cotton and growing and harvesting 18 acres of corn, are reported.

Farm-mortgage credit, D. L. WICKENS (*U. S. Dept. Agr., Tech. Bul. 288 (1932), pp. 102, figs. 18*).—"This bulletin aims to present the facts concerning farm mortgages as they have developed during recent years and then to suggest various methods by which the farmer can so manage his long-term financing as to make adjustment to problems that are likely to be encountered over a period of years."

The study is based principally on data included in reports of the U. S. Bureau of the Census for the 1910, 1920, and 1925 censuses, reports of the Federal Reserve Board, Federal Farm Loan Board, U. S. Departments of Agriculture, Commerce, and the Treasury, life insurance companies, and other financial institutions. In estimating the total farm mortgage debt as of January 1, 1925 and 1928, data were obtained from 22,352 replies to a questionnaire sent all farm owners, except part owners, in 85 counties in 47 States, and from reports of 642 bankers and county recorders in agricultural counties distributed throughout the United States.

The analysis for the most part is made by geographic divisions of the United States. The principal features and changes in farm mortgage indebtedness since 1910 and the sources of mortgage funds, the trends of the holdings of the principal types of lenders, the proportion of mortgage indebtedness by tenure of mortgagor, the ratios of mortgage indebtedness to value of farms, the relation of interest rates to farm mortgage financing, and the immediate and long-term problems of farm mortgage finance are analyzed and discussed.

Taxation of forest property in North Carolina, P. W. WAGER and R. B. THOMSON (*U. S. Dept. Agr., Forest Serv., Forest Taxation Inq. Prog. Rpt. 17 (1932), pp. [18]+132+[79], figs. 22*).—The forest conditions, the distribution of governmental functions, the sources of State and local revenues, the public debt of the State, counties, districts and townships, and cities and towns, the administration of the property tax, the procedure in tax delinquency, and the extent of tax delinquency for the State as a whole are described and discussed. The results of an intensive study in Beaufort, Chatham, and Macon Counties, representative of the three forest regions of the State are presented and discussed under the following headings for each county: Physical and economic foundations, forest resources, assessment practice, financial operations, trend in assessed value and tax rate, elements of the tax base, and tax delinquency.

The agricultural outlook for 1932 (*U. S. Dept. Agr., Misc. Pub. 144 (1932), pp. 110*).—This report, the tenth of the series previously noted (E. S. R., 65, p. 81), was prepared by the staff of the Bureau of Agricultural Economics,

assisted by representatives of the State agricultural colleges and extension services and the Federal Farm Board. The outlook for domestic demand, foreign competition and demand, the leading agricultural products, farm credit, labor, equipment, and supplies for the year 1932, and the long-time agricultural outlook are discussed from a national point of view.

Cycles in wheat prices, H. WORKING ET AL. (*Wheat Studies, Food Research Inst. [Stanford Univ.], 8 (1931), No. 1, pp. [1]+66, pls. 2, figs. 17*).—"The present study undertakes a comprehensive investigation of the major movements, apart from long-time trends, of United States wheat prices through 43 years, the characteristics of their behavior, and the factors which determine the movements (as distinct from the levels) of wheat prices." It is based chiefly on analysis of weekly averages of daily prices. Five important types of movements, all but one of which had certain cyclical characteristics, were found as follows: A seasonal cycle in cash prices and four nonseasonal price movements—crop-scare and related cycles, a long cycle, movements related to cyclical changes in wholesale prices in general, and movements directly attributable to the size of the world wheat crop harvested during the season (not notably cyclical in character).

The world wheat situation, 1930–31: A review of the crop year, M. K. BENNETT ET AL. (*Wheat Studies, Food Research Inst. [Stanford Univ.], 8 (1931), No. 2, pp. [1]+67–198, figs. 61*).—This is a continuation of the series previously noted (E. S. R., 65, p. 581). The wheat supplies in 1930–31, wheat price movements and levels, international trade in wheat and flour, wheat consumption in 1930–31, stocks and carry-overs, and the stabilization operations in the United States are discussed. An appendix briefly summarizes the significant developments in tariffs and milling regulations in different countries in 1930–31.

Crops and Markets, [March–April, 1932] (*U. S. Dept. Agr., Crops and Markets, 9 (1932), Nos. 3, pp. 89–120, figs. 2; 4, pp. 121–152, figs. 2*).—Included are tables, graphs, reports, summaries, and notes of the usual types. No. 3 also includes tables showing the farm stocks of wheat, rye, corn, barley, and oats, March 1, 1932, the percentage of each crop shipped out of the county where grown, and the percentage of corn of merchantable quality. No. 4 includes tables showing the intended plantings in 1932 of the principal crops, by States; the unloads of 19 fruits and vegetables in 66 cities during 1931; and the car-lot shipments of fruits and vegetables, by States, during March and for the seasons ended March 31, 1930, 1931, and 1932.

[Papers on rural sociology presented at the twenty-fifth annual meeting of the American Sociological Society] (*Amer. Sociol. Soc. Pub., 24 (1930), No. 4, pp. 3–49*).—Included are the following papers presented in the section on rural sociology at the meeting held at Cleveland, Ohio, December 29–31, 1930: Economic Relationships and Social Conflict, by C. R. Hoffer (pp. 3–8) (E. S. R., 65, p. 486); Social Conflict in a Rural School Situation—A Case Study, by J. L. Hypes (pp. 9–15); Technique for the Adjustment of Conflict among Town and Country Churches, by A. Z. Mann (pp. 16–27); A Rural-Urban Conflict Series, by E. deS. Brunner (pp. 28–33); Inter-community Conflict, by B. L. Hummel (pp. 34–40); and Town-Country Conflict—A Case Study, by W. Burr (pp. 41–49).

Social conflict (*Amer. Sociol. Soc. [Proc.], 25 (1930), pp. VII+258, figs. 5*).—This volume includes the papers read at the twenty-fifth annual meeting of the American Sociological Society, held at Cleveland, Ohio, December 29–31, 1930.

The papers bearing directly on rural sociology were as follows: Social Changes in Walworth County, Wisconsin—A Study of Trends in Town-Country

Relations, by R. A. Polson (pp. 139–142); A Social Program for Submarginal Land, by J. A. Dickey (pp. 181–189); and A Social and Economic Program for Submarginal Agricultural Areas, by G. S. Wehrwein (p. 190).

Other papers presented on rural sociology are noted above.

FOODS—HUMAN NUTRITION

Some essentials of a good nutrition experiment, H. H. MITCHELL (*Jour. Nutrition, 4 (1931), No. 4, pp. 525–538*).—This is an editorial discussion based upon the assumption that "a perfect experiment in any field of science may be said to be one that has been planned and conducted in such a way that the results obtained are susceptible of only one interpretation." Illustrations are given of types of experimentation in nutrition which are difficult to interpret, and the necessity is emphasized of reducing the number of interpretations to a minimum "by extending control in so far as feasible to every experimental condition that could possibly influence the animal function under observation and measurement, so that control and test animals are subjected in an equal degree to all experimental conditions except the one being studied, or that, in control and test periods, experimental conditions are similarly equalized."

Important among the implications involved in this proposition are individual rather than group feeding and control of food consumption with equalization of the food intakes of the groups to be compared.

In discussing the interpretation of experimental data, the danger of interpreting negative evidence is given special attention, with illustrations from well-known nutrition research. In conclusion, the limitations in the use of statistical methods in nutrition research are pointed out.

A modification of the Osborne-Mendel salt mixture, P. B. HAWK and B. L. OSER (*Science, 74 (1931), No. 1919, p. 369*).—The modified Osborne-Mendel salt mixture described is said to have the same composition as far as metallic elements and mineral acids are concerned but is prepared from more readily available salts and requires no evaporation or dehydration. The content of water of crystallization of some of the salts is slightly higher, requiring an adjustment in quantity when substituted for recommended amounts of the Osborne-Mendel salt mixture. For 4 per cent of the original mixture 4.4 or 4.5 per cent of the new mixture should be substituted.

The blackening of potatoes after cooking, C. K. TINKLER (*Biochem. Jour., 25 (1931), No. 3, pp. 773–776, pl. 1*).—In a preliminary study of the chemical changes involved in the blackening of potatoes after cooking, it has been demonstrated that the blackening is not the result of enzymic oxidation, and that it is intensified by traces of iron or alkali such as ammonium carbonate and lessened by the presence in the cooking water of a little acetic acid. It has also been shown that the extent of blackening corresponds in degree to the extent of development of a red color in raw potatoes on treatment with nitrous acid, followed by an alkali. This reaction, which is recommended as a simple test for determining whether or not potatoes will blacken on cooking, is described as follows:

"A transverse section of potato about 5 mm thick is peeled thinly and covered with 7 per cent sodium nitrite solution (about 25 cc) in a small porcelain basin. About 2 cc of dilute hydrochloric acid (1 volume of concentrated hydrochloric acid to 2 volumes of water) are added and the mixture left for 5 minutes. The liquid is then poured off and the section of potato covered with 10 per cent sodium hydroxide solution (about 25 cc). The red color develops in about 5 minutes, at first chiefly on the outer and inner edges of the fibrovascular

layer of the potato, then through the whole of this layer, but it often extends toward the center. It is strongly marked where there are eyes in any potato."

The chemical changes involved in the blackening have not been determined, although the theory is advanced that oxidation of a phenol or amine may be involved.

Midday meals for preschool children in day nurseries and nursery schools, M. E. SWEENY and C. CHATFIELD (*U. S. Dept. Agr. Circ. 203 (1932), pp. 47*).—This circular, which is a joint contribution from the Merrill-Palmer School at Detroit, Mich., and the U. S. D. A. Bureau of Home Economics, has been planned especially for those responsible for feeding groups of preschool children one or two meals a day, but the information presented is equally applicable to hospital, institution, and even home use where young children are to be fed.

A discussion of food standards for young children is first presented. The available data summarized and discussed include published reports by Holt and Fales (E. S. R., 47, p. 766), McKay (E. S. R., 56, p. 493), and Rose et al. (E. S. R., 65, p. 290) and hitherto unpublished data from the Merrill-Palmer School. The standards adopted in the present publication are based on the average values for calories, protein, fat, and carbohydrate of the daily food intake of the Merrill-Palmer children from 2 to 5 years of age, the values for the 3-year-old child being protein 3.5, fat 4, and carbohydrate 12.4 g and 99 calories per kilogram of body weight. For calcium and phosphorus, the Sherman recommendations of 1 g each per day and for iron an allowance of 9 mg per day or about 0.6 mg per kilogram of body weight were adopted.

The section on food standards is followed by sections on factors affecting the child's food intake and on menu planning. Since midday meals at nursery schools are given primary consideration, the menus are planned for these meals, which are designed to furnish half or more of the recommended daily food allowance for a 3-year-old child. At the Merrill-Palmer School this requirement is met with the lunch supplemented by cod-liver oil and tomato juice in the middle of the morning and milk in the afternoon. General directions are given for menu planning, followed by four typical menus with the composition of the recipes involved in each. To facilitate the planning of other meals, the data from the same recipes are tabulated in terms of the food values of one cupful of the various prepared dishes and of single servings of other foods. Additional tables are given showing the content of calcium, phosphorus, and iron in prepared dishes furnishing generous amounts of these minerals, of menus served for five consecutive days with the number of children having second servings, and of the cost per child of typical low and high menus in 1930, with some suggestions for economy.

A final series of tables is presented in which numerous recipes for prepared dishes appropriate for use in nursery schools are given, with the chemical composition of each of the ingredients.

A contribution on the distribution of calcium content in blood of children, M. SOKOLOVITCH (*Brit. Jour. Expt. Path., 12 (1931), No. 3, pp. 150–152*).—Determinations of the distribution of calcium in the blood serum and corpuscles of five healthy children and two children suffering from tetany, with rickets, are reported. No appreciable amounts of calcium could be detected in the corpuscles of the normal subjects, but values of 1.3 and 1.34 mg per cent were obtained for the corpuscles of the children in tetany. The possibility is suggested that some biochemical changes take place in infantile tetany which cause the transference of a certain percentage of the calcium content of the serum of the corpuscles.

The stability of calcium in the saliva and blood, M. FETTERLY and G. H. MAUGHAN (*Amer. Jour. Hyg., 14 (1931), No. 3, pp. 723–725*).—Observations on the calcium content of the saliva and the blood serum of 26 college women students in November and March at the beginning and end of systematic biweekly ultraviolet irradiations showed a constant content of calcium in the saliva of both groups and a slight decrease in that of the blood serum in both irradiated and nonirradiated groups. There was apparently no difference in the salivary calcium of those who had healthy and very poor teeth.

The utilization of the iron of protein foods by the albino rat: (A) A comparison of the growth and the iron assimilation as affected by different protein foods; (B) a comparison of protein foods supplementary to milk as sources of iron in nutrition, R. C. MILLER and E. B. FORBES (*Jour. Nutrition, 4 (1931), No. 4, pp. 483–505, figs. 3*).—Two series of experiments were carried out, following in general the same technic as in the previous study (E. S. R., 61, p. 791). In the first series the relative values of various foods as sources of iron were determined when each food served as a source of protein supplementary to skim milk powder. In all cases the skim milk powder constituted 44.37 per cent of the diet, and the other protein food was included in amounts calculated to furnish equal quantities of the supplementary protein. In the second series the materials tested served as the sole source of both protein and iron.

In the first series the best growth resulted with the diets containing a combination of milk powder and pecans. Good growth was also secured with milk powder supplemented with beef muscle, eggs, peanuts, and English walnuts. Less favorable results were secured when the milk powder was supplemented with liver and kidney, respectively. In the second series the best growth was secured with milk powder, good growth with beef muscle, beef kidney, beef liver, and eggs, and poor growth with beef brains, beans, and peanuts. On the basis of absolute quantities of iron stored, beef muscle, beef liver, and pecans were superior sources of iron; beef kidney, eggs, and peanuts of moderate value; and English walnuts and milk powder of lowest value. On the fresh and fat-free dry bases beef muscle, liver, and kidney ranked highest, eggs and peanuts next, and pecans, English walnuts, and milk lowest.

Factors influencing the vitamin content of foods, R. A. DUTCHER (*Pennsylvania Sta. Bul. 275 (1932), pp. 24, figs. 8*).—In this review and discussion of the literature on the subject, including a number of contributions from the author's laboratory, two main topics are considered: (1) Factors influencing the natural or normal vitamin content of foods of plant and animal origin and (2) the influence of food treatment on vitamin potency. The factors considered under food treatment are harvesting and field factors, storage, heat treatment, desiccation and fermentation, pasteurization and evaporation, cooking and canning, and irradiation. An extensive list of literature references is appended.

The influence of the addition of vitamins upon maintenance and survival periods in white rats on egg albumin-fat and egg albumin-carbohydrate diets [trans. title], F. MAIGNON and M. A. CHAHINE (*Compt. Rend. Soc. Biol. [Paris], 108 (1931), No. 36, pp. 929–931*).—Earlier studies on the relative value of carbohydrates and fats in the utilization of proteins, as determined by feeding experiments on rats (E. S. R., 40, p. 562), have been repeated with provision for the vitamins which were lacking in the earlier diets. Powdered spinach was given to supply vitamin A and dried yeast vitamin B. The Osborne and Mendel salt mixture was also included, and a mixture of

starch, sucrose, and dextrin in equal parts was substituted for the starch of the original study.

Whatever the proportion of fat or carbohydrate, the maintenance and survival periods were always longer on the egg albumin-fat diets than on the egg albumin-carbohydrate diets.

Observations on certain factors necessary for the normal nutrition of the rat, B. C. Guha (*Biochem. Jour., 25 (1931), No. 3, pp. 960–971, figs. 6*).—This is an extension of the earlier studies of Guha and Drummond (E. S. R., 63, p. 9), suggesting the possibility that yeast and milk contain essential nutrition factors other than the known vitamins.

The first experiments reported showed that in rats whose growth had been artificially stunted over a considerable period by the alternate administration and withdrawal of vitamin B_1 preparations, continued growth could not be maintained by the administration of 0.5 cc of a vitamin B_1 concentrate from wheat germ plus 1 cc of 50 per cent alkalized marmite as a source of vitamin B_2, or by double and treble the quantities of these two concentrates. Growth was markedly improved, however, following the addition of 0.5 g of dried brewer's yeast. In a similar series of experiments 0.5 g of fresh marmite proved effective, and growth was still further improved by 15 cc of milk daily. These experiments were extended to normal rats which had ceased to grow after about 9 or 10 weeks on the diet supplemented with the concentrates of vitamin B_1 and B_2. Again double and treble doses of the concentrates had only temporary effect, but the addition of a relatively small quantity of dried brewer's yeast brought about sustained growth and milk proved even more effective. Further tests gave additional evidence that yeast contains a factor other than vitamin B_1 or B_2, and that milk contains this factor and an additional one not found in yeast. The milk factor could not be identified with the other known vitamins A, D, C, or E, or any of the known amino acids.

In testing for the presence of the new milk factor in various foods, the basal diet containing the concentrates of vitamin B_1 and B_2 was fed for 10 weeks and the material to be tested was then added as a further supplement. A weekly increase of 10 g body weight for 3 or 4 weeks was adopted as the standard for good growth. As thus tested good growth was secured on from 1 to 1.5 g of egg yolk, spinach and grass dried at 35° C., and on from 10 to 25 cc of certified grade A milk; fairly good growth on 2 g of egg white and from 1 to 1.5 g of alfalfa; and slight growth on 2 g of pig liver and sheep liver. Negative results were obtained with carotene in 1-mg doses and with chlorophyll administered as 0.15 per cent of the diet.

The factor is not particularly stable to heat, as it was approximately half destroyed by boiling for 40 minutes and wholly inactivated by autoclaving at 18 lbs. pressure for 2¼ hours.

It is noted finally that although the experiments described resemble those of Coward, Key, and Morgan (E. S. R., 62, p. 589), thus pointing to the probability that the same substance is being dealt with, there are certain discrepancies in the observations reported by Coward et al. for the unknown factor in light white casein and the present milk factor.

Experiments on nutrition.—X, Comparative vitamin B_1 values of foodstuffs: Cereals, II, R. H. A. Plimmer, W. H. Raymond, and J. Lowndes (*Biochem. Jour., 25 (1931), No. 3, pp. 691–704*).—In continuation of the series of papers noted previously (E. S. R., 62, p. 294), data are reported on the vitamin B_1 content of cereals, using as the standard maintenance of adult

pigeons for a period of 26 weeks as in the preceding study instead of rearing of the young by adult pigeons as in the earlier study on cereals (E. S. R., 58, p. 390.)

The comparative values of the materials tested in percentages of the diet required for maintenance were dried yeast 4, marmite 6, wheat germ (Bemax) 6-7, middlings 10, baker's yeast 12, bran and buckwheat 20 each, millet 30, oatmeal 35, and wheat, barley, malt, rye, durra, and brown rice 40 per cent each. In terms of dried yeast as 100, the values for the whole cereals tested became buckwheat 20, millet 13, oatmeal 11, and the other cereals 10. These values show that cereals are not quite so rich in vitamin B_1 as the pulses tested in the previons study, as these had a comparative figure of 13.

The growth-promoting properties (vitamin B complex) of the concentrated water-soluble portion of milk, G. C. SUPPLEE, O. J. KAHLENBERG, and G. E. FLANIGAN (*Jour. Biol. Chem., 93 (1931), No. 2, pp. 705–725, figs. 10*).—This report on the differentiation of the vitamin B complex in the water-soluble concentrate of milk, described previously (E. S. R., 66, p. 594), is presented in three parts as follows:

Part I. *Variations in biological properties of different caseins.*—A series of tests on the biological properties of various caseins confirmed the conclusions of Chick and Roscoe (E. S. R., 60, p. 690) and Coward et al. (E. S. R., 63, p. 193) that some commercial caseins can not be freed completely from water-soluble growth-promoting factors by leaching with acidulated water. The necessity of determining the purity of caseins to be used in vitamin studies is emphasized.

Part II. *Growth-promoting properties of the water-soluble portion of milk.*—Observations are reported demonstrating that the milk concentrate is relatively richer in vitamin G than in B.

Part III. *Effect of high temperatures and ultra-violet radiations on the water-soluble milk vitamin concentrate.*—The milk vitamin concentrate was adjusted to pH 9, autoclaved for 5 hours at 120° C. with a resulting lowering of the pH to 4.5, and then fed at levels varying from 1.5 to 15 per cent of the diet with and without 2 per cent of rice polish. A lower rate of growth as compared with that on similar quantities of unheated material resulted in every case. In animals which were not given the autoclaved concentrate until after growth had ceased and pellagra-like symptoms had developed, improvement of these symptoms took place simultaneously with resumption of growth, and in animals receiving the amounts which did not promote growth the symptoms were not alleviated. In practically all of the tests a flattening of the growth curve appeared at a period coinciding with the period of adolescence. These findings are thought to indicate that vitamin G as now defined involves more than a single entity, and that the more thermolabile factor (or factors) in it is utilized particularly at the period of sexual maturity.

Intensive irradiation of the milk concentrate with ultra-violet light for a period of 10 hours gave inconsistent results, but destroyed to a greater or less extent both vitamins B and G.

The vitamin B content of commercial liver extracts and stomach preparations, E. GILROY (*Lancet [London], 1931, II, No. 20, pp. 1093–1098, figs. 4*).—Further data (E. S. R., 66, p. 197) are given on the content of vitamins B_1 and B_2 (B and G) in various proprietary liver and stomach preparations used in the treatment of pernicious anemia. All of the preparations contained vitamin B_2, and nearly all vitamin B_1 as well. The author suggests the possibility that in the treatment of pernicious anemia with liver extracts vitamin

B (B_1 and B_2) may act in restoring the normal metabolic functions which are required to elaborate the protein derivatives which are essential for blood regeneration. "Alternatively, following the successful administration of liver extract, vitamin therapy should be able to maintain a cure. In support of the latter alternative it can be stated that this procedure has been adopted recently in a small series of cases with satisfactory results. The period of observation to date is only three months, but it seems improbable that a normal blood picture would be maintained for this length of time as a result of the short preliminary treatment with liver."

The effect of partial depletion of vitamin B complex upon learning ability in rats, S. MAURER and L. S. TSAI (*Jour. Nutrition, 4 (1931), No. 4, pp. 507–516*).—This paper supplements a preliminary report (E. S. R., 62, p. 897) by furnishing evidence that "early partial depletion of vitamin B complex is detrimental to higher nervous function as measured by maze learning ability, but that the offspring of the depleted animals, i. e., those that survive the high infant mortality, can attain the normal level of learning ability provided they are brought up on a diet rich in vitamin B complex."

The effect of vitamin B deficiency upon the vitamin A reserves of the rat, W. J. DANN and T. MOORE (*Biochem. Jour., 25 (1931), No. 3, pp. 914–917*).—This problem was suggested by previous observations of the extraordinarily high content of vitamin A in the liver as compared with other organs of rats given diets rich in carotene (E. S. R., 66, p. 592), and the well-known fact that rats subsisting upon a diet deficient in the vitamin B complex show progressive loss in weight accompanied by disappearance of the body fat. Adult rats were maintained for about 200 days upon a diet rich in carotene, furnished by red palm oil, and then were given diets deficient in the vitamin B complex until severe emaciation resulted, when they were killed and examined as to the extent of remaining body fat and content of vitamin A in the liver oils.

In spite of an almost entire disappearance of the fat reserves throughout the bodies of the animals transferred to the vitamin B-deficient diet, there was no indication of a diminished power of transforming carotene into vitamin A or of a decrease in the vitamin A reserves in the liver. These results are thought to confirm the hypothesis that "the vitamin A reserves of the liver constitute a system quite apart from the general fat reserves of the body." It is noted in this connection that rats which died rather suddenly after long exposure to a diet deficient in vitamin A had almost normal fat deposits and a normal content of liver oil, but that both the body fat and liver oil gave completely negative results when tested for vitamin A.

Investigations on vitamin B_2.—I, The sources of vitamin B_2. II, The stability of vitamin B_2. III, The chemistry of vitamin B_2, B. C. GUHA (*Biochem. Jour., 25 (1931), No. 3, pp. 945–959, figs. 9*).—Preliminary reports of some of the results obtained in this extensive investigation of the nature and behavior of vitamin B_2 have been noted from other sources as indicated below.

The materials investigated as sources of vitamin B_2 were selected with a view to determining the most suitable material to use for the extraction of the vitamin for subsequent study and included aqueous extracts of brewer's top yeast, baker's yeast, ox liver, beef muscle, commercial liver extract, and Glaxo milk powder. The milk powder was also tested in the dry form. The fresh ox liver extract proved the most potent source of vitamin B_2, being active in a daily dose containing less than 6 mg of total solids, or the equivalent of about 0.3 g of the fresh liver. The commercial liver extract was also highly active, as noted previously (E. S. R., 65, p. 493), and in 20 per cent aqueous extract was

used for the chemical study. The material is considered to have several practical advantages over yeast for this purpose. The extract of baker's yeast was much richer in vitamin B_2 than brewer's yeast, the former giving as good growth in a dose corresponding to from 0.7 to 0.9 g of fresh yeast as the latter in a dose equivalent to 1.4 g. The milk powder was active only in the comparatively large dose of 0.4 g and the aqueous extract of beef muscle was comparatively inactive.

The principal conclusions concerning the stability and chemistry of vitamin B_2 have already been noted (E. S. R., 65, p. 612), as well as the conclusions concerning the relation of vitamin B_2 to pellagra (E. S. R., 65, p. 493; 66, p. 595).

"The occurrence of both vitamin B_2 and the factor specific for pernicious anemia in large quantities in liver raises the question of a relation between the two substances. The fact that a lowering of the erythrocyte count has been observed in vitamin B_2 deficiency (Sure, Kik, and Smith [E. S. R., 66, p. 190]) also lends point to this question. The general chemical behavior of the vitamin as shown in this paper is, however, in contrast to that of the factor for pernicious anemia, which has recently been stated by Dakin, West, and Howe to be a compound of β-hydroxyglutamic acid and *l*-γ-hydroxyproline."

A quantitative method for the determination of vitamin C, K. M. KEY and G. K. ELPHICK (*Biochem. Jour., 25 (1931), No. 3, pp. 888–897, pls. 2, figs. 2*).—The method employs the technic first suggested by Höjer (E. S. R., 57, p. 295) and worked out in greater detail by Goettsch (E. S. R., 60, p. 691). With the use of larger numbers of guinea pigs (15) and graded doses of orange juice and as a criterion for protection the histological appearance of the roots of the incisors after 14 days on the experimental diet, it was established that the average value for the degree of protection from scurvy plotted against the dose of orange juice gave a straight line curve. This curve can be used to compare any unknown substance with any standard.

In the authors' opinion orange juice is a satisfactory standard, since its antiscorbutic potency appears to be very constant and it can be given directly to the animals without previous treatment. Data are given illustrating the application of the method in determinations of the vitamin C content of Bramley Seedling apples and a sample of diluted tomato juice.

"This method is particularly useful for determining the antiscorbutic potency of substances containing little vitamin C. It is often difficult to give guinea pigs high enough doses of such substances to produce complete protection from scurvy, so that the minimum protective dose can not be directly determined. Also when testing an unknown substance, a dose might be chosen which would produce partial but not complete protection."

Tissue reactions in vitamin deficiency, E. BROWNING (*Amer. Med., n. ser., 26 (1931), No. 12, Sup. 4, pp. 5, 12, 14*).—This is a general discussion, with references to the literature, of the essential cellular changes brought about by a deficiency of each of the various vitamins at present recognized.

Growth in height and weight and retention of nitrogen, calcium, and phosphorus during recovery from severe malnutrition, G. STEARNS and D. L. R. MOORE (*Amer. Jour. Diseases Children, 42 (1931), No. 4, I, pp. 774–780, fig. 1*).—A case report is given showing remarkable gains in weight, height, and retention of nitrogen, calcium, and phosphorus in a boy 3½ years old during a rapid recovery from a condition of chronic diarrhea and malnutrition which had existed from the age of 2 months. The gain in weight began before growth in height, but when once started the latter was very rapid. During the 9

months in which records were kept the child gained 24.2 lbs. in weight and 5.7 in. in height, these being about 9 times and between 3 and 4 times, respectively, the customary gains in the average child. The retentions of nitrogen per kilogram of body weight during the period of rapid increase in weight were far greater than have been reported for infants during the period of most rapid growth, the largest retention observed being 0.486 g per kilogram of body weight. The retention of calcium was as large as that noted in rapidly growing infants, and was as large during the period before growth in height had begun as during the period of greatest growth in height. The retention of phosphorus corresponded well with calculated amounts for combination with amounts of calcium and nitrogen retained.

The effects of radiant energy on milk anemia in rats, P. C. Foster (*Jour. Nutrition, 4 (1931), No. 4, pp. 517–524, figs. 2*).—Evidence is reported indicating that irradiation with a quartz mercury arc has a slight but significant effect in increasing the hemoglobin content and the number, size, and saturation of the red cells of the blood of rats rendered anemic on a milk diet, but that a flaming carbon arc is without effect. In general the radiations failed to prevent the initial fall in hemoglobin, although in some series it retarded and diminished this fall. The effect was greatest after the fourth week when the hemoglobin had reached its lowest level.

HOME MANAGEMENT AND EQUIPMENT

A summary of the standard of living in Nebraska farm homes, J. O. Rankin and E. H. Hinman (*Nebraska Sta. Bul. 267 (1932), pp. 36, figs. 11*).—The study is based on data collected in a survey made in 1924, in cooperation with the Bureau of Agricultural Economics, U. S. D. A., of 342 farm homes located in 4 typical farming areas of the State. It is confined chiefly to an analysis of the money value of goods used and the factors affecting its distribution. Detailed analyses of the data have been previously noted (E. S. R., 57, p. 685; 61, p. 196; 64, p. 190; 66, p. 694).

Tables and charts are included and discussed showing the composition of families and households; age, nativity, and education of operators and home makers; size and value of farms and dwellings; amounts of nonfarm income; value of family living by main items; and the relation and value of family living and tenure, expenditure groups, size of family, age of operator, locality, and value of farm. Comparison is made with the findings of Kirkpatrick in 11 States (E. S. R., 56, p. 185).

The average standard of living in the homes studied appeared adequate for maintenance of health, but rather limited as to comforts and far from luxurious. Physical needs, on the whole, were well provided for, but social needs were somewhat scanted. The living standard was relatively high in the value of food and operation goods consumed but low in value of clothing, education, and recreation as compared with similar homes surveyed in other States. Size of farm household was the most important factor affecting the standard of living. Schooling of operator showed little correlation with his standard of living. Schooling of children showed considerable correlation. The proportion of expenditures used for food and operation goods decreased and the proportion used for clothing, furniture, health, and advancement increased with increases in total family expenditures.

Home production of the family's food supply (*Michigan Sta. Circ. 140 (1932), pp. 36, figs. 8*).—Information regarding the food requirements of the family and the production of different food items is presented in articles as follows: A Yearly Food Plan for the Family, by M. Dye; The Home Vegetable

Garden, by C. H. Mahoney; Growing the Family Fruit Supply, by R. E. Loree; Producing the Potato Supply, by H. C. Moore; Producing the Bean Supply, by H. R. Pettigrove; Keeping Small and Medium Sized Flocks of Poultry, by C. G. Card; Producing the Home Meat Supply, by G. A. Brown; and The Family Cow, by E. L. Anthony.

Utilization of anthracite for domestic heating, A. J. JOHNSON (*Heating, Piping, and Air Conditioning, 3 (1931), No. 12, pp. 1050–1054, figs. 12*).—In a contribution from the Anthracite Institute Laboratory the experimental apparatus used in domestic heating studies is described, and information is given on the selection of sizes of anthracite for different purposes and the selection, installation, and operation of mechanical draft units, automatic anthracite stokers, and magazine feed boilers.

It has been found that the practical firing interval for a given fuel is directly proportional to the rate of combustion and very closely linked to the uniformity of burning. With anthracite the overall efficiency of the furnace is not materially affected by changes in the stack draft available.

Data are given on proper ash pit pressures for various combustion rates and coal sizes when using mechanical blowers. It is desirable so to locate the blower that the greatest volume of air will pass through the fuel bed at a point farthest from the uptake of the furnace.

It is recommended also that a bright spot be kept in the fuel bed for the ignition of gas whenever mechanical draft is employed.

Electric heating, J. C. WOODSON (*Scranton, Pa.: Internatl. Textbook Co., 1931, pts. 1–2, pp. IV+83+54, figs. 58*).—This book consists of two parts. Part 1 deals with the theory of heat, fundamental units of heat and heat terms, heat transfer, electric heating elements, refractory materials, and heat-insulating and resisting materials. Part 2 deals with domestic, commercial-cooking, and industrial appliances.

MISCELLANEOUS

List and analytical index of publications of the Alaska Agricultural Experiment Stations, January, 1898, to July, 1931, E. H. LANGDALE (*Alaska Stas. Circ. 3 (1932), pp. 56*).—A detailed subject index of these publications.

Annual Report of the North Louisiana Experiment Station, Calhoun, Louisiana, 1931, S. STEWART (*Louisiana Stas., North Louisiana Sta. Rpt. 1931, pp. 30*).—In addition to meteorological observations, the experimental work not previously reported is for the most part abstracted elsewhere in this issue.

Report of the Fruit and Truck Experiment Station, Hammond, Louisiana, 1931, B. SZYMONIAK (*Louisiana Stas., Fruit and Truck Sta. Rpt. 1931, pp. 34*).—The experimental work not previously reported is for the most part noted elsewhere in this issue.

NOTES

Massachusetts College.—The honorary degree of doctor of laws was conferred upon Dr. R. W. Thatcher, retiring president of the college, by Amherst College at its one hundred and eleventh annual commencement.

Cornell University.—According to a note in *Science*, Dr. Cornelius Betten has been appointed dean of the university faculty. Dr. C. E. Ladd has been appointed dean of the Colleges of Agriculture and Home Economics, and Dr. W. A. Hagan dean of the College of Veterinary Medicine. Flora Rose, formerly associate director of the College of Home Economics, has been appointed director, vice Dr. Martha Van Rensselaer, whose death is noted editorially on page 97 of this issue.

Pennsylvania College and Station.—In the cooperative tobacco investigations of the station and the U. S. Department of Agriculture, approximately 140 experimental plats have been laid out on a tract of 10 acres near Lancaster. These plats will be utilized in a 9-year study of the effect of fertilizers on the tobacco plant. Nitrogen will be supplied as a mixture of nitrate of soda and cottonseed meal; phosphoric acid as superphosphate; and potash as sulfate of potash. Rotation trials are also contemplated.

An extensive landscaping program for the college grounds is to be undertaken. Present work is being centered around the new dairy building and the sheep, beef, and dairy barns, but future developments will include the entire agricultural group. A central oval stock judging and show area is to be laid out between the sheep barn and the proposed horse barns, and extensive plantings will be made of trees and shrubs and other landscaping material.

Frederik Rasmussen, head of the department of dairy husbandry from 1916 to 1919, died February 21 at the age of 55 years. He was a native of Denmark, entering this country in 1899 and graduating from the Iowa College in 1905. Prior to coming to Pennsylvania he had filled positions at Purdue University, the Iowa College, and the New Hampshire College. He had subsequently served as secretary of agriculture for the State of Pennsylvania and at the time of his death was executive secretary of the International Association of Ice Cream Manufacturers, with headquarters at Harrisburg.

Virginia Truck Station.—Dr. H. H. Zimmerley, senior olericulturist in the U. S. D. A. Bureau of Plant Industry and formerly horticulturist of the station, has been appointed director beginning July 15.

Washington College Station.—Anthony Spuler, associate entomologist and stationed at Wenatchee, was, together with Mrs. Spuler, drowned in Lake Wenatchee on Memorial Day when their small motor boat capsized in a storm. Mr. Spuler was a native of Idaho, but graduated from the Washington College in 1917, received the M. S. degree in 1919, and had been associated with the institution since graduation. A recent statement by the station characterized his work as follows: "Possessed of great ability, initiative, and energy, he never faltered but blazed a new trail in the field of insect control. He was best known for his work in developing the use of moth traps as an indicator of the time to spray and for his careful research on oil sprays and other insecticides for codling moth control. Many of the results obtained in his work are the basis of established orchard practices in the Pacific Northwest."

EXPERIMENT STATION RECORD

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EDITORIAL

MONTHLY ISSUES OF EXPERIMENT STATION RECORD

Effective July 1, 1932, the frequency of issue of *Experiment Station Record* has been changed to a monthly basis. There will continue to be two volumes per year, but under the contemplated plan instead of 9 numbers, each of 100 pages, a volume will consist of 6 numbers averaging 150 pages each. Unless modification of this plan becomes necessary at a later date, the total number of pages per volume will, therefore, remain as at present, and the index numbers will not be affected.

The change in policy to fewer and larger issues has been adopted primarily as an economy, but it is also expected to prove more convenient and advantageous in most other aspects as well. It is in fact a return to the monthly schedule formerly in effect, deviation from this having been made in 1909 in order to obtain a much-needed enlargement of space for abstracts without violation of the printing act of 1895 limiting to 100 pages all publications issued in editions of over 1,000 copies. This limitation is no longer in force, and it is believed that abolition of the supplementary or "abstract" numbers is a logical and desirable development.

As regards costs, a saving will be effected by the omission of six issues per year of covers for these issues and their printing, the expense of wrapping and mailing, and a proportionate reduction in the postage charges on copies sent abroad. Regular intervals will also be restored between issues, and this will permit of somewhat greater flexibility in preparation and handling. The previous ---of one number each month and an additional number in months has always been confusing, while the monthly ---edule is simple and readily comprehended.

As regards the use of the *Record*, it is hoped that the convenience due to the concentration of material into fewer issues will be sufficient to offset at least in part two recognized disadvantages. One of these is the greater difficulty in locating citations to previous abstracts because of the abandonment of the uniform 100-page size

of issue. Under that system a reference to page 295 of a previou number was invariably to be found in the final pages of No. 2 Under the new plan its whereabouts will ordinarily be in a similar location in No. 2, but possibly, since an average rather than a precise quota of 150 pages is contemplated, it may be carried over into the early pages of No. 3. This difficulty, however, will be relatively unimportant when bound volumes are available.

The second drawback results from the absence of a detailed table of contents. Some difficulty is doubtless already experienced in locating articles in the longer sections, and this will be intensified with an approximate increase of 50 per cent in the length of sections. Here again, however, it may be suggested that the inconvenience will largely disappear upon the publication of the index numbers. Consideration was given to a plan for annual volumes which presented some possibilities for still further economies, but the continuance of the semiannual arrangement will preserve the relatively prompt availability of the indexes, and it is hoped to diminish the interval without them still further.

One circumstance tending in this direction is the recent completion of copy for another general index, covering volumes 51–60. Several months must still elapse before this general index will be printed, and it seems probable that the small edition will restrict somewhat rigidly its free distribution, but it is expected that it will be readily obtainable by purchase through the Superintendent of Documents, Government Printing Office, at moderate cost. In this connection, attention is called to the fact that the general indexes for both volumes 25–40 and 41–50 are still available for purchase through the Superintendent of Documents, the first-named at 75 cents and the second for $1.25 per copy.

The present number of the *Record* (No. 3) is the first of the current volume to be prepared under the new monthly arrangement, Nos. 1 and 2 (July and August) having been included in the printing quota of the previous fiscal year and made up in accordance with its requirements. It becomes, therefore, the September, 1932, issue, and the volume will terminate with No. 6 (December) and the usual index number.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Agricultural chemistry, I, A. MENOZZI (*Chimica Agraria. Milan: Ulrico Hoepli, 1931, vol. 1, pp. XII+546, figs. 21*).—This first volume of the author's general textbook on agricultural chemistry takes up in part 1, plant organic chemistry (chapters 1 to 6), the carbohydrates—sugars and their derivatives; the glucosides; pectic substances; vegetable organic acids; the fatty substances of plants; and the nitrogenous substances of plants. Part 2, the nutrition of the green plant (chapters 7 to 11), deals with the production of organic matter; the changes and movements of organic material, reserve material, and plant respiration; nitrogen nutrition; the mineral nutrition of the plant; and the water requirements of the plant.

Systematic organic chemistry, W. M. CUMMING, I. V. HOPPER, and T. S. WHEELER (*London: Constable & Co., 1931, 2. ed., rev., pp. XXIV+555, figs. 85*).—This is the second edition (revised by Cumming and Hopper) of this textbook and laboratory manual on "modern methods of preparation and estimation."

In part 1 a chapter discusses apparatus and methods. Part 2, devoted to specific preparations, deals with the linking to carbon of carbon, hydrogen, oxygen, nitrogen, sulfur, and halogen, and the linking to nitrogen of hydrogen and nitrogen. Part 3 deals with qualitative and quantitative analyses, molecular weights, etc. Part 4 takes up the preparation and testing of the inorganic reagents needed and tests for the common organic acids, for alkaloids, and for carbohydrates and glucosides.

Capillary chemistry, II, H. FREUNDLICH (*Kapillarchemie. Leipzig: Akad. Verlagsgesell., 1932, 4. rev. ed., vol. 2, pp. XI+955, figs. 113*).—Volume 1 of this work has already been noted (E. S. R., 64, p. 7). The four main parts of the present volume, which deals as a whole with colloid disperse systems, are colloidal solutions—sols and gels, clouds and smokes, foams, and dispersions in solid dispersion media.

Studies on the effect of alkali on protein.—I, The optical behavior of "racemic protein," F. A. CSONKA and M. J. HORN (*Jour. Biol. Chem., 93 (1931), No. 2, pp. 677–684, figs. 2*).—Wheat gluten, casein, and egg albumin, in the investigation reported in this contribution from the Bureau of Chemistry and Soils, U. S. D. A., were digested with 0.5 M sodium hydroxide at 38°. The products which were separated from the alkali digest were optically active, but when boiled with 20 per cent hydrochloric acid they yielded hydrolyzates which were practically optically inactive. It is suggested that the name "racemized protein" for these alkali digestion products be discontinued, on the ground that it is misleading. Dakin's theory of keto-enol formation is discussed, and the conclusion is reached that it does not give a satisfactory explanation for the observations here reported. The change from asymmetric to symmetric carbon atoms, required by the Dakin theory, was found not to take place in the alkali treatment.

Diffusibility of the proteins of normal and pathological plasma, O. H. GAEBLER (*Jour. Biol. Chem., 93 (1931), No. 2, pp. 467–477, fig. 1*).—Flat collodion membranes of high permeability showed a different permeability for protein in opposite directions. Dialysis experiments on plasma with alcohol-treated membranes gave no evidence that proteinuria is due to an increase in the diffusibility of plasma proteins or to the presence of substances increasing the permeability of artificial membranes.

Studies on the spontaneous oxidation of cysteine, II, III, E. G. GERWE (*Jour. Biol. Chem., 92 (1931), Nos. 2, pp. 399–411, fig. 1; 3, pp. 525–533*).—Earlier work (E. S. R., 65, p. 201) is continued.

II. *The autoxidation of cysteine free from iron.*—Pure cysteine was found to oxidize spontaneously, though at a very slow rate; the rate of this autoxidation was accelerated by the addition of very small quantities of iron, the acceleration being roughly proportional to the amount of the metal added. The rate of combination of pure cysteine with oxygen was shown to be many times greater than could be attributed to traces of iron present.

III. *The method of action of cyanides and cystine on cysteine oxidation.*—The autoxidation of iron-free cystine was not inhibited by cyanides. The addition of iron greatly accelerated the oxidation of pure cysteine, but subsequent addition of cyanide to the catalyzed oxidation reduced its rate to the original value. Potassium cyanide is considered to inhibit iron catalysis by converting ferric or ferrous salts to the corresponding potassium iron-cyanide compounds. Iron added in the form of potassium ferrocyanide or potassium ferricyanide did not accelerate oxidation. Pure iron-free cystine did not catalyze cysteine oxidation.

The effect of acid denaturation upon the combining power of fibrinogen, M. FAY and B. M. HENDRIX (*Jour. Biol. Chem., 93 (1931), No. 2, pp. 667–675, figs. 3*).—Fibrinogen from beef blood was found to be denatured by standing with hydrochloric acid at pH 2.5 to 3.5 for 12 to 15 hours at 12 to 14° C., the acid and base-combining power of fibrinogen being diminished by this acid denaturation. The acid-denatured fibrinogen had an isoelectric point of pH 5.2, the undenatured one of 4.7. The buffer values of the untreated and of the acid-treated protein, calculated from the combining curves, showed the buffer value of the acid-treated fibrinogen to be less than that of the untreated protein throughout the entire range of the titrations.

Studies of the peptides of trivalent amino acids.—I, Titration constants of histidyl-histidine and of aspartyl-aspartic acid, J. P. GREENSTEIN (*Jour. Biol. Chem., 93 (1931), No. 2, pp. 479–494, figs. 2*).—Report is made upon the apparent dissociation constants of histidyl-histidine, aspartyl-aspartic acid, histidine, and aspartic acid as determined at 25° C.

"It is demonstrated that the introduction of a second imidazole ring in the histidine compound causes a decided weakening of the acid and basic groups as compared with those of histidine itself, accompanied by a shift to a more acid dissociation range of one of the imidazole groups. The isoelectric point of the peptide is more acid than that of the amino acid. The coincidence of three carboxyl groups and one amino group, as in aspartyl-aspartic acid, results in a mutual weakening of both acid and basic groups and a slightly alkaline shift of the isoelectric point as compared with the isoelectric point of aspartic acid. The titration curves of the peptides studied apparently approach more nearly in character the ordinary titration curve of a protein than any synthetic ampholyte hitherto investigated."

The apparent dissociation constants of methionine and of isoserine, O. H. EMERSON, P. L. KIRK, and C. L. A. SCHMIDT (*Jour. Biol. Chem., 92 (1931),*

No. 2, pp. 449–452, figs. 2).—In continuation of work on the dissociation constants of amino acids already noted (E. S. R., 63, pp. 410, 411), the authors present and discuss the titration curves and numerical data obtained in their study of methionine and of isoserine. For methionine, at 25°, were calculated. $K'_a=6.17\times10^{-10}$, $pK'_a=9.21$, $K'_b=1.91\times10^{-12}$, $pK'_b=11.72$, and $pI=4.74$. The values obtained for isoserine at this temperature were $K'_a=5.37\times10^{-10}$, $pK'_a=9.27$, $K'_b=6.03\times10^{-12}$, $pK'_b=11.22$, and $pI=6.02$. "The dissociation constants of methionine are characteristic of the monoaminomonocarboxylic amino acids. The value for K'_a of methionine is, however, slightly greater than that for most of the members of this group of amino acids. . . . The apparent basic dissociation constant of isoserine is somewhat greater than the corresponding value for serine."

The oxidation catalysis of crystalline glutathione, with particular reference to copper, C. Voegtlin, J. M. Johnson, and S. M. Rosenthal (*Jour. Biol. Chem., 93 (1931), No. 2, pp. 435–453, figs. 6*).—It is shown in this contribution from the U. S. Public Health Service that the oxidation of crystalline glutathione in phosphate buffer of physiological pH is accelerated in the presence of relatively small amounts of salts of copper, palladium, gold, and cobalt; and of selenates, selenites, and tellurites. Copper was found by far the most effective catalyst. Under the same experimental conditions salts of iron, manganese, nickel, tin, lead, cerium, mercury, platinum, chromium, osmic acid, and arsenites (in relatively low concentration) did not influence the rate of oxidation of glutathione, but salts of silver, zinc, cadmium, bismuth, and antimony in suitable concentrations decreased it.

"The so-called autoxidation of crystalline glutathione, prepared according to Hopkins, is due to the presence of minute traces of copper in this material. . . . Prolonged heating of aqueous glutathione solutions in vacuo at 37° causes decomposition. The addition of iron salts to this material mixed with phosphate buffer shows that the oxygen consumption is accelerated by iron salts. The rate of oxidation of cysteinyl-glycine anhydride in phosphate buffer is greatly increased by copper salts, but not by iron salts. . . . A possible physiological relationship between copper and glutathione has been suggested."

Complexes of crystalline glutathione with silver, cadmium, mercury, and arsenic were prepared.

The apparent dissociation constants of hydroxyvaline, K. J. Czarnetzky and C. L. A. Schmidt (*Jour. Biol. Chem., 92 (1931), No. 2, pp. 453, 454, fig. 1*).—Using the technic in obtaining the titration curve and in determining the dissociation constants already indicated in the immediately preceding and earlier papers, the authors present, with the titration curve found, the following numerical values for the apparent dissociation constants at 25° C.: $K'_a=1.97\times10^{-10}$, $pK'_a=9.71$, $K'_b=4.05\times10^{-12}$, $pK'_b=11.39$, and $pI=6.15$. "These values do not differ very markedly from those which have been reported for valine. The apparent basic dissociation constant of hydroxyvaline is a little greater than that of valine." The values are compared also with those for certain other amino acids with and without substituent hydroxyl groups.

The formation of semiquinones as intermediary reduction products from pyocyanine and some other dyestuffs, L. Michaelis (*Jour. Biol. Chem., 92 (1931), No. 2, pp. 211–232, figs. 11*).—It was shown for the three dyestuffs, pyocyanine, α-oxyphenazine, and rosinduline, that between the oxidized and the reduced state there exists, provided the solution is very acid, an intermediate state recognizable by its particular color. An analytical treatment of the titration curves showed that this intermediate state is not a meriquinone

(a molecular compound of the reduced and the oxidized forms) but a nonpolymerized, half reduced state with the character of a free radical. It is suggested that this intermediate state may be designated as a semiquinone, in distinction to a meriquinone. The conditions for its coexistence in a true equilibrium with the other forms of a quinone-hydroquinone system are discussed. Its existence was found to depend both on pH and on the oxidation-reduction potential of the solution. These two variables being used as coordinates, the existence of the semiquinone is made evident by a wedge-shaped area.

Chemical structure and optical rotation.—I, The configurational relationship of disubstituted propionic acids containing a phenyl group. II, On the optically active trisubstituted methanes containing a phenyl group, P. A. LEVENE and R. E. MARKER (*Jour. Biol. Chem., 93 (1931), No. 2, pp. 749–774*).—Relationships between certain structural groups, including certain groups contributing an absorption band in the ultra-violet near the limit of the visible spectrum, and the direction and extent of optical rotation are shown and discussed upon theoretical grounds.

Studies on glycogen: The hydrolysis of glycogen in various concentrations of acids, and the hydrolysis of glycogen with takadiastase, M. SAHYUN and C. L. ALSBERG (*Jour. Biol. Chem., 93 (1931), No. 2, pp. 235–254, fig. 1*).—The rate of hydrolysis of glycogen either with sulfuric or with hydrochloric acid followed the course of a pseudomonomolecular reaction, the specific rotation of the final product being identical with that of glucose. Phosphoric acid acted more slowly.

The first change observed in the acid hydrolysis of glycogen was the disappearance of the opalescence, an observation which led to the belief that the first action of the acid is to reduce the particle size, since "this nonopalescent glycogen appears to have all the other characteristics of glycogen so far investigated and to give rise, when acted upon by acids, to an ultrafiltrable saccharide or mixture of saccharides, which is the direct source of glucose." The diastase converted 52 per cent of the glycogen into reducing sugars. Whether the glucose was or was not the only reducing sugar appearing in this hydrolysis could not definitely be determined. Of the glycogen not converted into reducing sugar, a part at least appeared as an ultrafiltrable polysaccharide. Other observations with reference to the diastase hydrolysis of glycogen are also recorded.

An observation incidental to the investigation was that "a commercial preparation of takadiastase can easily be purified by ultrafiltration through a cellophane membrane. Most of the inorganic and organic impurities as well as the coloring matter pass through the membrane into the ultrafiltrates. The active enzyme is retained in the nonultrafiltrable fraction."

Oxidations induced by sugars.—I, The formation of barium peroxide, P. A. SHAFFER and B. K. HARNED (*Jour. Biol. Chem., 93 (1931), No. 2, pp. 311–325, fig. 1*).—An activation of molecular oxygen by the aeration of reducing sugars in alkaline solutions showed itself in the formation of hydrogen peroxide in sodium hydroxide solutions, and of barium peroxide in solutions of barium hydroxide, about one-fifth of the oxygen absorbed appearing, under the most favorable conditions set up in these experiments, as barium peroxide.

The yield of barium peroxide was decreased by increase of sugar concentration, by decrease of alkalinity, and by increase of temperature. No peroxide other than that of hydrogen was directly identified in the sugar solutions, though the view that the primary product is a peroxide of the sugar, hydrogen peroxide being formed by its reaction with water and hydroxyl ions, is advanced.

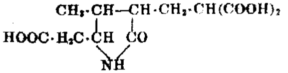
The course of the oxidation of the aldose sugars by bromine water, H. S. ISBELL and C. S. HUDSON (*[U. S.] Bur. Standards Jour. Research, 8 (1932), No. 3, pp. 327–338, figs. 6*).—The optical rotation of a buffered glucose solution upon bromine oxidation was found to rise to a point corresponding approximately with the rotation of the delta gluconic lactone; then the rotation decreased to a minimum value at a rate corresponding to the hydrolysis of the delta lactone; and finally the rotation slowly increased to a point corresponding to the equilibrium rotation of gluconic acid. These changes agreed qualitatively with the hypothesis that the delta gluconic lactone is formed in solution immediately after the oxidation of the sugar by bromine water. "Apparently the 1, 5 ring form of glucose is oxidized directly to the 1, 5 gluconic lactone," but the authors feel that further data must be obtained before this mechanism is definitely established.

The oxidation of various sugars was followed by the same method and similar changes were observed, indicating that the aldose sugars in general are oxidized by bromine water in slightly acid solution to the delta lactones rather than to the sugar acids as previously believed. In addition to that of glucose, the behavior of *d*-galactose, *l*-arabinose, *d*-xylose, and lactose was investigated.

The allergically active substance in ragweed pollen: A chemical and biological study, A. STULL, R. A. COOKE, and R. CHOBOT (*Jour. Biol. Chem., 92 (1931), No. 3, pp. 569–588*).—Together with some observations on the direct skin test, the authors of this contribution from the Cornell University Medical College and the New York Hospital report the more strictly chemical findings that cold absolute and 95 per cent alcohol removed water-soluble reducing substances, nitrogenous material, and acidity, but no active substance, while 70 per cent alcohol removed a large amount of inert gum and some active substance, leaving the bulk of active substance in the pollen residue. From the pollen of the giant ragweed was isolated an active substance that produced the symptoms and skin reactions in individuals clinically sensitive to ragweed pollen (hay fever), and in its chemical reactions and elementary analysis was a typical simple protein of albuminous nature. Desensitization experiments showed this to be the only active substance.

On the basis of the ash-free substance, the elementary analysis of the protein gave the figures, carbon 50.37, hydrogen 6.4, and nitrogen 13.52 per cent.

A tribasic acid present in liver, convertible into pyrrole derivatives, H. D. DAKIN and R. WEST (*Jour. Biol. Chem., 92 (1931), No. 1, pp. 117–133*).—An acid of which the elementary analysis indicated the empirical formula $C_{11}H_{15}O_7N+H_2O$ was obtained in the form of its quinine salt in yields up to about 1 per cent from a powdered liver extract. On the basis of the reactions and decompositions of this compound, in which no free amino group was indicated by nitrous acid, no unsaturated linkages by reaction either with acid or with alkaline permanganate, and of which the reaction with diazo compounds was quite negative, it was tentatively assigned the structure of a pyrrolidone derivative, as follows:



Solubility of bone in solutions of magnesium salts, J. C. FORBES (*Jour. Biol. Chem., 93 (1931), No. 2, pp. 255–263*).—The solubility of bone calcium in water solutions was greatly increased by magnesium salts; the greater the

magnesium concentration the greater the calcium solubility. In the absence of phosphates from the original solution the calcium went into solution as a phosphate and as some other compound, possibly the hydroxide or carbonate. It was found that when posphates were present even to a moderate extent in the original solution, marked solution of bone calcium might take place with an actual decrease in the phosphate concentration of the solution. Increasing the calcium or phosphate concentration of the original solution decreased the solution action of magnesium salts, especially when these were present in low concentrations.

Bone was found to have a marked neutralizing action against acids, the pH of all weakly acid solutions being rapidly increased to over 7 by the neutralizing action of the bone.

Further progress in the isolation of the vitamins (*Lancet [London], 1932, I, No. 5, p. 251*).—Editorial comment with literature references on reports of the isolation of vitamins A, B_1, C, and D. These reports have been noted from original sources.

Pure carotene and vitamin A [trans. title], Van Stolk, J. Guilbert, H. Penau, and H. Simonnet (*Jour. Pharm. et Chim., 8. ser., 14 (1931), No. 5, pp. 193–214*).—This is a more complete report of an investigation noted previously from another source (E. S. R., 65, p. 804).

The determination of vitamin A in cod-liver oils (a) biologically, (b) chemically, (c) physically, with a statistical examination of the results, K. H. Coward, F. J. Dyer, R. A. Morton, and J. H. Gaddum (*Biochem. Jour., 25 (1931), No. 4, pp. 1102–1120*).—In this cooperative investigation the vitamin A potency of 11 cod-liver oils and 2 concentrates was determined biologically, chemically, and physically, and the results of all three series of determinations were examined statistically. In the biological tests, which were conducted in the laboratories of the Pharmaceutical Society of Great Britain, the technic followed was that developed by Coward et al. (E. S. R., 66, p. 591). The chemical tests, conducted and reported on by Dyer, of the same laboratories, included tests of the oils and concentrates and their unsaponifiable fractions for antimony trichloride blue value in comparison with Lovibond blue glasses as determined by the Carr and Price (E. S. R., 56, p. 10) technic, the natural tint matched in diffused daylight against the Lovibond yellow and red glasses in a tintometer and the values of the free fatty acids as free oleic acid. The Fearon (E. S. R., 55, p. 712), phosphomolybdate, and trichloroacetic acid tests were aso tried but considered unsatisfactory. The physical examination of the oils by Morton, of Liverpool University, included measurements of the intensities of the 328 mμ absorption of the oil and the 572 and 606 mμ of the blue color obtained with antimony trichloride on the oils following the technic of Morton and Heilbron (E. S. R., 60, p. 689). The statistical examination of the results was made by Gaddum at the National Institute for Medical Research.

In general the oils having high biological values had (1) a high blue value obtained by the action of antimony trichloride on the oil itself, although the two values did not always run parallel, (2) a high blue value obtained by the action of antimony trichloride on the unsaponifiable fraction of the oil, this value running more nearly parallel, (3) high values for the absorption bands 572 and 606 mμ, and (4) high values for the intensity of the 328 mμ absorption band of the oils themselves. These absorption bands all ran parallel with the activity of the oil, although it was noted that numerous oils have been examined in which this did not hold true.

The statistical examination of the results led to the conclusion that "the discrepancies between the physical and biological measurements are much larger than the known sampling error of the biological test; that, of the

physical and chemical measurements, the best agreement with the figures determined by the biological method was given by the measurement of the 328 mμ absorption band, and nearly as good agreement was given by the Lovibond blue value of the unsaponifiable fraction of the oil; that both the 572 mμ and 606 mμ bands gave less good agreement; that the Lovibond blue value obtained from the oils themselves give the least good agreement, and it would appear to be unwise to rely upon this method for the measure of vitamin A in an oil. It can only be used as a very crude indication of vitamin A potency."

Crystalline vitamin D, F. A. Askew, R. B. Bourdillon, H. M. Bruce, R. K. Callow, J. St. L. Philpot, and T. A. Webster (*Roy. Soc. [London], Proc., Ser. B, 109 (1932), No. B 764, pp. 488–506, figs. 4*).—This more complete report of the experimental evidence leading to the announcement of the isolation of vitamin D (E. S. R., 66, p. 709) includes a brief review in chronological order of the papers reporting the progress of attempts at isolating vitamin D in the authors' laboratory and in that of Windaus. This is followed by a description of the methods used, including a simple process for preparing the pure product from the irradiation products of ergosterol without distillation, a discussion of the properties of Calciferol and two allied inactive compounds, Pyrocalciferol and sterol X (the Lumisterin of Windaus), and the evidence pointing to the identity of Calciferol and the vitamin D_2 of Windaus.

Attention is called to the fact that the purified product considered to be vitamin D still produces toxic effects when given in excessive doses.

Crystal structures of vitamin D and related compounds, J. D. Bernal (*Nature [London], 129 (1932), No. 3251, pp. 277, 278*).—This is a preliminary report of the results obtained in the X-ray examination of crystals of ergosterol and certain of its irradiation products, as described above by Askew et al. From the observations, which are summarized in tabular form, certain conclusions are drawn concerning the structural changes taking place in the conversion of ergosterol into Calciferol. It is suggested that the changes involve the carbon skeleton and not merely the position of the double bonds in the molecule, but it is thought doubtful whether any conclusive evidence of the actual intramolecular change can be found by X-ray examination alone. "The most hopeful method would seem to be the examination of the ultraviolet absorption and Raman spectra of single crystals with polarized light at liquid hydrogen temperatures."

Crystallized vitamin D_1 [trans. title], A. Windaus, O. Linsert, A. Lüttringhaus, and G. Weidlich (*Liebigs Ann. Chem., 492 (1932), No. 2–3, pp. 226–241, figs. 5*).—This paper reports the details of the evidence noted in the addendum to the paper of Windaus and Lüttringhaus (E. S. R., 66, p. 709) as pointing to the identity of vitamin D_1 with the new Calciferol of Askew et al. The preparation and properties of vitamin D_1 and various derivatives are described in detail.

Alcoholic fermentation, A. Harden (*London and New York: Longmans, Green & Co., 1932, 4 ed., pp. VII+243, figs. 10*).—It is stated that the volume of the work on the subject of alcoholic fermentation appearing "since the publication of the third edition of this book [E. S. R., 50, p. 806] has been so great that it has been impossible to attempt to give a complete account of it, but it is hoped that nothing of fundamental importance has been overlooked."

The use of the microscope, J. Belling (*New York: McGraw-Hill Book Co., 1930, pp. XI+315, figs. 28*).—This is a practical handbook for routine and research work. A feature is a list of 62 causes of injury to the microscopical image, the nature of the injury in each case and the remedy for it being

indicated in parallel columns. The effects, on the one hand, of disregarding the laws of optics involved, and on the other of adhering fairly closely to the rules arising from these laws, are also summarized in parallel columns in the introductory chapter. One example of these effects is the reduction, by improper methods of use, of the maximum useful magnification of the 1/12 in. oil-immersion objective of N. A. 1.3 from about 1,250 under good conditions to about 800 under unsuitable conditions of the adjustment and use of the microscope and its illuminating system.

The chapter headings include use of the hand magnifier; use of the compound microscope; the twin-objective binocular; the monobjective binocular; the monocular microscope; the routine microscope; illumination; light filters and screens; the condenser; the object; the cover-glass problem; the objective; the water-immersion objective; mirror, stage, nosepiece, and drawtube; the eyepiece; microscope outfits; drawing; photography; testing the microscope; care of the microscope; rules for high-power and routine microscopy; the past and future of the microscope; literature of the microscope; discoveries with the microscope; a hundred microscopical objects of biological interest; fixing and staining microscopic objects; and 50 practical exercises with the microscope, together with three appended sections.

Practical microscopy, L. C. MARTIN and B. K. JOHNSON (*London and Glasgow: Blackie & Son, 1931, pp. [7]+116, pls. 10, figs. [77]*).—The field of this condensed guide is similar to that of the book above noted, but the treatment is, with the exception of that of metallurgical and of ultra-violet microscopy, much less complete. The following chapters make up the book: Magnification, stand and mechanical parts, objectives and eyepieces, numerical aperture, methods of illumination of the object, dark-ground illumination, photomicrography, the metallurgical microscope, preparation of specimens for the microscope, binocular microscopes, polarized light and the microscope, ultra-violet microscopy, and the interpretation of the image in the microscope.

A quinhydrone-collodion electrode of special applicability in experimental pathology, J. C. HUGHES (*Jour. Biol. Chem., 92 (1931), No. 3, pp. 513–524, figs. 3*).—A quinhydrone-collodion electrode which allows the determination of the hydrogen-ion activity of a solution without alteration of the solution itself is described. It was found stable in biologic fluids unsuitable for study by other methods, and especially adapted to use in a closed system in which definite partial pressures of dissolved gases may be maintained. The electromotive force developed was shown to attain a value within 1 millivolt of its final value in from 3 to 10 minutes, depending on the thickness of the membrane and of the quinhydrone deposit.

"Ease of preparation and reproducibility, together with precision of potentials, characterize the electrode. The value of E_q should be determined by means of of solutions similar or identical in composition with those studied and whose pH may be determined directly with the hydrogen electrode."

Essentially, a gold-plated platinum wire electrode is immersed in saturated quinhydrone solution contained in a small collodion sack, which is itself immersed in the fluid of which the H-ion activity is to be measured. The sample solution is connected to the standard half-cell through a saturated potassium chloride bridge in the usual way.

An improved lactic acid apparatus, E. S. WEST (*Jour. Biol. Chem., 92 (1931), No. 3, pp. 483–485, fig. 1*).—For the apparatus described and figured are claimed the advantages (1) that its condensing unit is of improved efficiency, "which assures adequate cooling within a wide range of tap water temperature and makes the apparatus more compact and sturdy"; and (2) that the use of

rubber connections has been reduced to a minimum. The assembly is designed for use in the permanganate and in the manganese dioxide oxidation methods.

The principles of applied acidimetry, U. PRATOLONGO (*Principii di Acidimetria Applicata. Milan: Ulrico Hoepli, 1931, pp. XII+221, pls. 2, figs. 26*).—This is a small manual designed to cover the application of the new methods of acidimetry to agricultural, analytical, biological, food, and industrial chemistry. Its first section takes up in chapter 1, generalities, such matters as hydrogen-hydroxyl ions, reaction, acid and base dissociation constants, buffer solutions, etc.; and under the head of methods for the measurement of hydrogen-ion concentration, the electrometric and colorimetric processes. The second section, applications, deals with a considerable number of specific materials and cases.

The titration of hydroxy organic acids in the presence of ferric and cupric salts, C. V. SMYTHE (*Jour. Biol. Chem., 92 (1931), No. 2, pp. 233–244, figs. 6*).—Titration curves, obtained with the aid of the glass electrode are reported for lactic, glycollic, oxalic, malic, tartaric, and citric acids, and for each of these acids in the presence of ferric chloride and in the presence of cupric chloride. The presence of these metal salts greatly altered the titration curves. The nature of this change is discussed, and the application of the results is pointed out. The formation of complex ions containing the respective metal is held responsible for the greater part of the observed effect. It is noted that "if one were to determine by titration the amount of these acids present in a solution containing proportionately as much iron, or in some cases as much copper, as the solutions used here, and were to use the turning point of phenolphthalein as end-point, the result would be in error by over 30 per cent."

The use of the antimony electrode for determining the pH value of soils, E. E. BARNES and R. H. SIMON (*Jour. Amer. Soc. Agron., 24 (1932), No. 2, pp. 156–162, fig. 1*).—The equations for the computation of pH values from antimony electrode potentials were obtained by the authors of this contribution from the Ohio Experiment Station from the experimentally determined potentials of the antimony electrode in standard buffer solutions covering the range pH 1.4 to 11.4. From pH 1.4 to 6.4 there was found a constant difference between the hydrogen electrode-saturated calomel half cell potential difference and the antimony electrode-saturated calomel half cell P. D. From pH 6.8 to 8.8, however, the difference between the P. D. values of the two systems became "an increasing series, the different values being a linear function of the pH values." From pH 9.2 to 11.36 the differences between the potential differences again became constant, averaging 0.29 volt. "Thus, for the first range from pH 1.4 to pH 6.6, the appropriate equation for the antimony electrode is $pH=\frac{V_{Sb}}{0.059}+0.28$; for the range from pH 6.6 to pH 8.8, $pH=\frac{V_{Sb}}{0.04625}-1.51$; and for the range of pH 8.8 to 11.4, $pH=\frac{V_{Sb}}{0.059}+0.74$."

A note on the use of selenium oxychloride as a catalyst in the determination of nitrogen by the Kjeldahl method, C. E. RICH (*Cereal Chem., 9 (1932), No. 2, pp. 118–120*).—Report is made of preliminary experiments indicating that the addition of 0.2 c c of selenium oxychloride together with the usual copper catalyst may considerably reduce the time required for the digestion of samples in the Kjeldahl nitrogen determination.

"The cost of selenium oxychloride may exclude it from ordinary routine analyses, but during rush periods, when results are required in the shortest length of time possible, the addition of 0.2 c c of selenium oxychloride to the digestion mixture will enable the operator to give more rapid service, inasmuch as he will be able to report analyses at least half an hour sooner than by the method in which copper and sodium sulfate are used as the catalysts."

A note on the use of selenium as a catalyst in Kjeldahl digestion with natural gas heat, R. M. Sandstedt (*Cereal Chem., 9 (1932), No. 2, pp. 156, 157*).—The author of this contribution from the Nebraska Experiment Station compared the use of 0.1 g of metallic selenium with that both of 0.1 g of copper and of 0.7 g of mercuric oxide, the test samples consisting (1) of a flour of high protein content and (2) of a ground bran, while the digestion was carried out in each case with 25 c c of sulfuric acid and from 12 to 13 g of potassium sulfate in addition to the catalyst. The results were determined after digestion periods of 30, 45, 60, 90, 120, and 150 minutes. The heat applied was the most intense that could be used without allowing the flame to reach the flask above the liquid or the blue cone of the flame to touch the glass.

"Under these conditions metallic selenium acted more rapidly than metallic copper, and at about the same rate as mercuric oxide. The digestion of the samples with selenium and with mercuric oxide was almost complete in 30 minutes and was complete in 45 minutes; while the digestion with copper was complete in one hour. It appears that there is greater danger of losing nitrogen by extremely long digestion with selenium than with the other catalysts. . . . One-tenth g of metallic selenium powder, the amount used for one determination, costs approximately 0.15 ct. as against about 0.48 ct. for 0.7 g of mercuric oxide or about 0.002 ct. for 0.1 g copper.

"Selenium also has the advantage over mercury of not requiring a precipitant in distillation."

The determination of nitrates in soils containing soluble organic matter, M. J. Plice (*Soil Sci., 33 (1932), No. 3, pp. 213–215*).—This contribution from Cornell University, noting the failure of the clarifying reagents in common use to remove soluble coloring matters from samples containing or consisting of litters and duffs, together with the difficulty of securing the required decolorization by the permanganate method, proposes the use of concentrated hydrogen peroxide and ammonium hydroxide. For this a technic found very satisfactory is thus described:

"A soil-water mixture is prepared in the usual manner but without the addition of a precipitating agent. After the mixture is filtered, a little powdered $Ca(OH)_2$ (0.5 g to 100 c c solution) is added to the filtrate. . . . The filtrate should be stirred after the addition of the hydroxide and allowed to stand for several minutes and then filtered. . . . An aliquot of the filtrate is placed in a porcelain dish and evaporated to dryness. . . . The evaporating dish is allowed to cool and approximately 0.5 c c of 1:1 ammonium hydroxide is added. The dish is then rotated carefully in order to wet thoroughly all of the residue. Five to fifteen drops of superoxol are then added, according to the intensity of the brown color, and the dish is again rotated until the superoxol is in thorough contact with all of the residue. The reaction may be accelerated by placing the dish on a steam bath and carefully evaporating the solution to dryness. If any discoloration remains, the residue should again be wetted with the ammonia and superoxol and evaporated. If a discoloration should still persist, it is most probably due to traces of iron or manganese and not due to organic matter. . . . The residue is finally wetted with ammonia and evaporated to dryness in order to expel any excess of the superoxol. From this point the regular procedure [of the phenoldisulfonic acid method for nitrates] is followed."

It was shown that nitrites, in part, apparently, because of their extreme instability in the presence of strong ammonia, are not oxidized to nitrates to any determinable extent. That nitrates are not destroyed in the process described was demonstrated by the addition and determination of known quantities of nitrates.

A source of error in nitrogen and phosphorus determinations on filtrates obtained after precipitation of tissue colloids by trichloracetic acid or other strong acid, H. D. KAY (*Jour. Biol. Chem.*, *93* (*1931*), *No. 2*, *pp. 727–732*).—The author finds that in determining nonprotein nitrogen, choline, amino nitrogen, or acid-soluble phosphoric esters in fresh tissue, when the determination proper is preceded by precipitation of the proteins with trichloroacetic acid or with other strong acids, "it is essential that the precipitate should not remain in contact with the acid for more than a few minutes. If this precaution is not taken, particularly with tissues having a high lipid content, there is the certainty of hydrolysis of lipids, which may proceed sufficiently far in a short time to render the results of such determinations entirely without value."

Comparison of two per cent citric acid and neutral ammonium citrate solutions as solvents for phosphates, K. D. JACOB, L. F. RADER, JR., and W. H. ROSS (*Jour. Assoc. Off. Agr. Chem.*, *15* (*1932*), *No. 1*, *pp. 146–162*).—A study was made of the solubility of 87 samples of various phosphatic materials in 2 per cent citric acid and neutral ammonium citrate solutions, according to the official methods of analysis, the materials investigated including di- and tricalcium phosphates, calcium hydroxyphosphate, various bone products, mineral calcium phosphates, basic slags, calcined phosphates, iron and aluminum phosphates, superphosphates, ammoniated superphosphates, wet-mixed base goods, limed superphosphates, and citrate-insoluble residues from superphosphates and ammoniated superphosphates.

"The di- and tricalcium phosphates, calcium hydroxyphosphate, bone products, and mineral calcium phosphates, except macro-crystalline fluor-apatite, were significantly more soluble in 2 per cent citric acid than in neutral citrate solution, even when samples weighing only 0.5 g were used for the citrate digestion. Under the conditions prescribed by the official methods, bone ash and the mineral calcium phosphates were relatively insoluble in both solvents, macro-crystalline fluor-apatite being practically insoluble. The figures obtained for citric acid-insoluble phosphoric acid in basic slags were, in general, very close to those obtained for citrate-insoluble phosphoric acid when 0.5 g samples were used for the citrate digestions. Fluorspar basic slags were only slightly soluble in both citric acid and citrate solutions. . . .

"Significant decreases in the citric acid-insoluble phosphoric acid content of crude dicalcium phosphate, tricalcium phosphate, calcium hydroxyphosphate, bone products, high-grade basic slag, and phosphate rock, were obtained by decreasing the weight of sample from 2 g to 0.5 g. In general, decreasing the weight of sample from 2 g to 0.5 g caused smaller changes in the citric acid-insoluble phosphoric acid content of superphosphates and ammoniated superphosphates. But little change in the citric acid-insoluble phosphoric acid content of fluorspar basic slag, calcined phosphate, macro-crystalline fluor-apatite, and iron and aluminum phosphates was obtained by decreasing the weight of sample."

A new colorimetric method for the estimation of potassium, H. R. D. JACOBS and W. S. HOFFMAN (*Jour. Biol. Chem.*, *93* (*1931*), *No. 2*, *pp. 685–691*).—The new principle involved in the method here contributed from the University of Chicago is that of the colorimetric use of a stable green color developed from cobalt compounds in the presence of choline and ferrocyanide. The potassium is precipitated from suitably prepared samples in the usual way as the cobaltinitrite, and the cobalt content of this precipitate is then colorimetrically determined by means of the newly described green compound. Figures showing the accuracy of the results obtained in applying the method to a variety of inorganic and biological materials are tabulated.

A colorimetric method for the determination of carbon dioxide, E. M. EMMERT (*Jour. Assoc. Off. Agr. Chem., 14 (1931), No. 3, pp. 386–389, fig. 1*).—The carbon dioxide, said to be satisfactorily freed from other acidic substances and from basic contaminants by bubbling through 1 per cent sulfuric acid, was determined by absorbing it, in an assembly indicated in a diagram accompanying the note, into a solution of the sodium salt of phenolphthalein, and determining in a colorimeter the extent to which the color of the phenolphthalein salt was discharged. The formula used in calculating the carbon dioxide from the colorimeter data is stated.

The quantitative determination of methoxyl, lignin, and cellulose in plant materials, M. PHILLIPS (*Jour. Assoc. Off. Agr. Chem., 15 (1932), No. 1, pp. 118–131, figs. 3*).—For the determination of the methoxyl group the author of this contribution from the U. S. D. A. Bureau of Chemistry and Soils adapted a modification of the Zeisel method, in which the methyliodide is absorbed by pyridine. Lignin is regarded as best estimated by isolation with fuming hydrochloric acid, followed by the deduction from the weight of the isolated crude lignin of its ash content and of 6.25 times its nitrogen content. It is noted that, although the nitrogen compounds in the crude isolated lignin may not be of a proteinaceous character, the use of this protein factor, N×6.25, appears the best present procedure. Cellulose was determined by a modification of the Cross and Bevan (E. S. R., 39, p. 614) method. The calculation of the furfural, obtained by distilling with 12 per cent hydrochloric acid the cellulose thus isolated, to pentosan to be deducted from the crude cellulose to give a figure for "pure cellulose" is criticized on the ground that the furfural may come from sources other than pentosans. The furfural determination should be made, but "the best procedure to follow is to express the results as 'per cent furfural in Cross and Bevan cellulose.'"

The Vieböck and Schwappach method for the determination of methoxyl and ethoxyl groups, E. P. CLARK (*Jour. Assoc. Off. Agr. Chem., 15 (1932), No. 1, pp. 136–140, fig. 1*).—Noting the importance of the methoxyl determination in many agricultural products not necessarily pure compounds, together with a number of objections to the pyridine absorption form of the Zeisel procedure and the limitation of the last-named method to the methoxyl group only, the author of this contribution from the U. S. D. A. Bureau of Chemistry and Soils calls attention to a method in principle the same as that of Zeisel, except that the alkyl iodide is collected in an acetic acid solution of potassium acetate to which a little bromine is added. The following reactions then occur:

$$CH_3I + Br_2 \rightarrow CH_3Br + IBr;\ IBr + 2Br_2 + 3H_2O \rightarrow HIO_3 + 5HBr$$

"The solution containing the iodic acid is washed into a flask containing a little sodium acetate, the excess bromine is removed with formic acid, potassium iodide is added, the solution is acidified with sulfuric acid, and the liberated iodine is titrated with 0.1 N thiosulfate. As 6 atoms of iodine are liberated for each mol of OCH_3, 1 c c of 0.1 N thiosulfate is equivalent to approximately 0.5 mg of methoxyl. It thus follows that 20–30 mg of substance is ample for a macro determination." The author's modification of this procedure is given in working detail, and the construction of the apparatus used is shown in a diagram. Methoxyl and ethoxyl were both determined.

Contributions to the micro determination of cholesterol, M. YASUDA (*Jour. Biol. Chem., 92 (1931), No. 2, pp. 303–312*).—The modifications of Okey's procedure (E. S. R., 65, p. 13) here proposed are thus summarized:

By the use of acetone the separation of cholesterol digitonide from the excess of digitonin and lipids is greatly facilitated. By solution of the digitonide in hot absolute alcohol and filtration it can be entirely freed from im-

purities and delivered in a form convenient for further treatment. The whole procedure is considerably simplified, and the modified method can be carried out easily and quickly with accurate results. "Comparative results by the colorimetric and oxidative methods on tissue extracts show that the colorimetric method gives about 15 per cent higher values than the oxidative method and that the difference is not the same for all tissues."

A simplification of the Okey method for the determination of cholesterol by oxidation of the digitonide, M. E. TURNER (*Jour. Biol. Chem., 92 (1931), No. 3, pp. 495–498*).—Okey's method, referred to in the preceding abstract, is regarded as "an intricate procedure," in the use of which a high degree of accuracy "can be attained only after considerable training and experience"; and the need for special and difficultly obtainable apparatus is also noted, together with some other points of difficulty. Because of these complications, "a simplification has been developed in which the precipitation, washing, and oxidation are accomplished in the one centrifuge tube," a 15-c c centrifuge tube with conical bottom and well fitted ground stopper. Like the original procedure of Okey, the modified method depends upon the oxidation of cholesterol digitonide.

The use of the Molisch (α-naphthol) reactions in the study of sugars in biological fluids, J. H. FOULGER (*Jour. Biol. Chem., 92 (1931), No. 2, pp. 345–353, figs. 2*).—As a ring test, the author regards the Molisch reaction as "very crude" both because of the danger of charring at the surface of contact between the sugar solution and the concentrated sulfuric acid, and because the lack of control of the concentration of the sugar tends to the production of qualitatively the same results for all carbohydrates. An improved qualitative test based upon the Molisch reaction is thus described:

"0.5 c c of the solution to be tested is mixed with 5 c c of cold 75 per cent (by volume) sulfuric acid. Three drops of a 3 per cent alcoholic solution of α-naphthol are added and thoroughly mixed with the acid mixture. A yellow color is produced by the addition of the naphthol. The mixture is warmed, preferably in a water bath, to about 80°. According to the chemical structure and concentration of the sugar present, a red to blue-violet color will be produced throughout the whole mixture."

Further, "for the purpose of a spectrophotometric study of the Molisch test more rigid conditions were maintained. One c c of sugar solution was mixed, in a 60-c c flask, with 10 c c of cold 75 per cent sulfuric acid. One-tenth c c of a 3 per cent solution of α-naphthol in 95 per cent alcohol was added and the flask shaken to give thorough mixing. The mixture was then heated for exactly 20 minutes in a water bath at 45°. After being cooled (by placing the flask in cold water) the colored solution was transferred to an observation tube 3 cm long. The absorption of light in the visible region between 4,800 a. u. and 6,400 a. u. was measured by a . . . spectrophotometer, consisting of a constant deviation type spectrometer and a Martens photometer. The light source was a 250-watt Mazda lamp. The results were expressed as the extinction coefficient, log $\frac{\text{incident light}}{\text{transmitted light}}$."

Aldoses gave red pigments having an absorption maximum between 4,800 a. u. and 5,100 a. u. while ketoses gave red-violet or blue-violet pigments with an absorption maximum between 5,500 a. u. and 5,800 a. u. Furfuraldehyde gave a red-violet Molisch test with maximum absorption between 5,400 a. u. and 5,500 a. u. Ketoses were detected in a variety both of normal and of abnormal biological fluids.

Determination of glycogen in tissues, M. SAHYUN (*Jour. Biol. Chem., 93 (1931), No. 2, pp. 227–234*).—In principle, the glycogen is absorbed from an

alcoholic-alkaline medium upon activated charcoal, the glycogen-charged charcoal is separated by centrifugation, hydrolysis is effected by two hours' boiling in 2 N sulfuric acid, and the solution is then neutralized and transferred to volumetric flasks. Filtered aliquots were found clear and colorless and suitable for the sugar determination.

Some physical properties of levulose and its estimation by copper reduction methods, R. F. JACKSON and J. A. MATHEWS ([U. S.] *Bur. Standards Jour. Research, 8 (1932), No. 3, pp. 403–444, figs. 3*).—Certain of the fundamental physical properties of levulose were determined with a view to facilitating its quantitative determination. Densities of aqueous solutions are given at 20° and 25° C. for concentrations 0 to 70 per cent. Expansions were measured over a 50° temperature interval. The density of crystalline levulose was shown to be 1.598. Refractive indices of levulose solutions were measured at 20° and 25° C. between 0 and 90 per cent concentration. The saccharimetric rotations of levulose solutions were measured at 20° and at 25°, and the change of rotation over a 50° interval of temperature was determined.

Copper reduction methods for the determination of levulose were also studied, and simplified methods of computation have been devised which permit the rapid calculation of the levulose content of sugar mixtures.

Methods of determining glucose and fructose in corn tissues, V. H. MORRIS and E. F. WEBB (*Plant Physiol., 7 (1932), No. 1, pp. 47–62, figs. 2*).—Carried out by the Ohio Experiment Station with the cooperation of the U. S. D. A. Bureau of Plant Industry, the investigation here reported involved the application of the iodometric method, the Nyns' potassium cupro-carbonate oxidation, and the method of determining combined reducing power, polarization, and sucrose directly on samples both of expressed sap and of alcoholic extracts.

With pure sugar samples all three methods gave results which were well within the limit of accuracy desired for samples of corn tissues. The iodine and Nyns' methods gave glucose values in every way in excellent agreement when these methods were used either with expressed sap or with alcoholic extraction samples. The results obtained by the polarization method with the corn samples were consistently higher, the mean values being about 8 per cent higher. "The precision of the method, however, was equal to the other two and probably has some value in preliminary studies."

Free reducing sugars could be determined from the sum of glucose by iodine and fructose by Nyns' methods with the same degree of accuracy as directly by the reducing power with Fehling's solution. Either expressed sap or alcoholic extraction samples could be used equally well with all three methods.

Iodine test for field corn, J. D. WILDMAN (*Jour. Assoc. Off. Agr. Chem., 15 (1932), No. 1, pp. 167, 168*).—In the iodine test for field corn, the author of this contribution from the U. S. D. A. Food and Drug Administration has shown that the reaction produced by immature sweet corn kernels may often closely resemble that from normal field corn by reason of the fact that the blue-black color produced by the starch present has a tendency to mask the brown of the dextrin reaction. In other instances it was found that neither black nor brown was produced. That the carbohydrates are not laid down uniformly in the corn endosperm was shown to be another factor tending to produce doubtful reactions.

In carrying out the test as originally directed, the author considers it advisable to add the precautions (1) to reserve part of all kernels tested for a retest of all kernels producing a reaction like that of field corn; and (2) to count as field corn only those kernels which have a firm, compact texture and show no evidence of brown coloration on two or more tests.

The interferometric determination of alcohol in blood, J. C. Bock (*Jour. Biol. Chem., 93 (1931), No. 2, pp. 645–655, figs. 4*).—The sample, 10 ml of the blood to be examined, was added in a 50 ml glass-stoppered volumetric flask to 35 ml of the phosphomolybdic acid protein precipitant described below. After gentle agitation (not shaking) to effect thorough mixture, the flask was filled to the mark with the phosphomolybdic acid reagent, the materials were well mixed, and, after standing about 10 minutes, were transferred to a 50 ml centrifuge tube, the centrifuge being run for about 10 minutes at a high speed. The separated liquid was then run through a coarse filter, and 25 ml were distilled at a moderate rate to yield about 20 ml of distillate, which was made up to volume in a 25-ml volumetric flask to form the solution of which the alcohol content was determined in the interferometer. The alcohol contents, ranging from 0.04 to 0.2 per cent, were determined with a maximum discrepancy of 0.0015 per cent.

The phosphomolybdic acid protein precipitant was made by dissolving 12 g of phosphomolybdic acid and 10 g of sodium sulfate crystallized in 600 ml of water, adding 9 ml of concentrated sulfuric acid, and making up, after boiling for 15 minutes and cooling, to a final volume of 1 liter.

The principles and manipulation of the interferometer used are briefly explained.

The effect of processing, handling, and of testing procedures on the fat content of ice cream, E. W. Bird and E. A. Johnson (*Iowa Sta. Bul. 287 (1931), pp. 361–383*).—Samples of ice cream mixes were taken from the holding vat after homogenization, while frozen ice cream was obtained at the time batches were pulled from the freezer. Samples representative of retail material were obtained with a dipper from the packer when it was from one-third to two-thirds full. All samples were tested to determine the effect of various fat tests, temperatures, type of test bottle, aging and freezing, retail handling, and condition of material on its fat content.

There was no difference of commercial importance in the fat tests of ice cream mix and that of the same mix after it had been frozen. The temperatures of sampling from 77 to 95° F. did not affect the fat analysis of the material. The Babcock-Gerber test gave results which averaged approximately 0.7 higher than the Mojonnier test. The 80 per cent acetic-concentrated hydrochloric acid test gave average values which were about 0.9 per cent lower for ice cream mix and 1.1 per cent lower for melted ice cream than the corresponding Mojonnier tests. The 80 per cent acetic-concentrated sulfuric acid method gave values that were in close agreement when 9-g 50 per cent cream test bottles were used, and tests that were wholly satisfactory for plant control work were obtained when an 18-g 8 per cent milk bottle was used with reader oil. The Mojonnier analyses of melted ice cream were usually lower than the same analyses of the mix, the variation sometimes amounting to 0.6 per cent.

There was little difference in the fat tests of ice cream as drawn from the freezer and the same lot from the packer in the retail store. Fat tests for frozen ice cream agreed within 0.2 per cent or less with the analyses of the mixes, but were lower in all cases. Analyses of the mix, ice cream, and scrapings from the freezer sides and from the dasher showed no indications of churning during the freezing process. When samples were mixed after having been melted they churned readily, especially at the higher sampling temperatures.

Based on this study, it is recommended that samples of mix be taken from the holding vat after the entire mix has been thoroughly agitated; also that samples should be kept frozen until ready for analysis, because it is possible to

have variations as great as 1 per cent when ice cream is sampled in a melted condition.

The quantitative determination of enzyme action, A. K. BALLS (*Jour. Assoc. Off. Agr. Chem., 15 (1932), No. 1, pp. 131-136*).—The present status and the basis of methods for the determination of the activity of diverse types of enzymes are outlined, and a suggestion of the adaptability of these methods to the uses of the analytical laboratory is made.

AGRICULTURAL METEOROLOGY

Manual of meteorology.*—Vol. IV, *Meteorological calculus: Pressure and wind, N. SHAW and E. AUSTIN (*Cambridge, Eng.: Univ. Press, 1931, vol. 4, rev. ed., pp. XX+359, pls. 3, figs. 79*).—This is a revised edition of the fourth and concluding volume of the manual, the different volumes of which have been noted as issued (E. S. R., 64, p. 13).

The seasonal forcasting formulae used in the India Meteorological Department, S. R. SAVUR (*India Met. Dept. Sci. Notes, 4 (1931), No. 37, pp. [2]+57-68, fig. 1*).—This paper gives the results of an examination by the Fisher method of the various formulas used in the meteorological service of India, with a view to determining the factors which are of greatest significance. Three factors shown by the study to have especially significant bearing on the seasonal forecast are Cape, South American, and local pressure.

Investigations on the dynamics and prediction of hail in Hungary and on the eastern border of the Alps [trans. title], L. AUJESZKY (*Met. Ztschr. (Brunswick), 48 (1931), No. 12, pp. 484, 485; abs. in [Internatl. Rev. Agr.], Mo. Bul. Agr. Sci. and Pract. [Rome], 23 (1932), No. 3, p. 77*).—In this article the author discusses the factors that determine the formation of hail and reports the successful prediction of hail in Hungary in 1931.

The prediction of warm and cool summers in east Hungary [trans. title], F. B. GROISSMAYR (*Időjárás (Weather), 35 (1931), No. 11-12, pp. 186-190, fig. 1; Ger. trans., pp. 202-206*).—This article, in Hungarian and German, reports an attempt to determine the weather conditions in other parts of the world which may be correlated with cool or warm summers in east Hungary and may be used as a basis for prediction.

The measurement of rainfall in agricultural climatology [trans. title], L. CHAPTAL (*Ann. Agron. [Paris], n. ser., 1 (1931), No. 2, pp. 223-245, figs. 2; abs. in Deut. Landw. Rundschau, 9 (1932), No. 3-4, pp. 148, 149*).—Calling attention to the relative neglect of climatic effects in plant growth and the importance of studying the individual climatic factors, the author reports mathematical determinations of the optimum intensity and most effective amounts of precipitation as related to soil conditions and plant growth, applying the results especially to the rainfall of 1926 in Paris and Montpellier. He shows a wide variation in the available and useful rainfall at the two places, but especially at Montpellier.

Meteorological observations, [March—April, 1932], C. I. GUNNESS and K. M. WHEELER (*Massachusetts Sta. Met. Ser. Buls. 519-520 (1932), pp. 4 each*).—The usual summaries are given of observations at Amherst, Mass., with brief notes on the more significant features of the weather of each month.

Relations of bioclimatics to the other sciences, A. D. HOPKINS (*Science, 75 (1932), No. 1951, pp. 535, 536*).—Reference is made to "two volumes on a new science of bioclimatics" which have been prepared by the author "as a result of long-continued studies of natural phenomena with special reference to life, climate, seasons, and geographical distribution," and in which there is developed a system of basic principles and methods applicable "to any line of

research in any science requiring a general or specific consideration of the basic elements of time, temperature, and distance in the relations between life, climate, seasons, and geographical distribution."

Influence of climate on man (*Handbuch der Klimatologie*, herausg. von W. Köppen and R. Geiger. *Band I, Teil E, Einfluss des Klimas auf den Menschen. Berlin: Borntraeger Bros., 1930, vol. 1, pt. E, pp. [3]+80, figs. 7; abs. in Met. Ztschr. [Brunswick] 49 (1932), No. 4, p. 165*).—This number contains two parts, Medical Climatology, by W. Borchardt (pp. 1–63), and Climate and Culture, by K. Wegener and W. Köppen (pp. 65–80).

SOILS—FERTILIZERS

A field classification of soils for use in the soil survey, J. H. Ellis (*Sci. Agr., 12 (1932), No. 6, pp. 338–345, figs. 2*).—Criticism is made of various schemes of soil classification. For example, "in the series system of naming soils, local geographic or place names are used; but there is nothing in the names except the textural ending which refers to the soil or its characters, or that shows the relationship of soils which are found together in the same area. Each series is a separate unrelated unit, and whatever may be the advantages of the series system for purely local use, its general use results in a multiplicity of names which are meaningless and confusing to anyone not familiar with them." As an improvement upon any of the other systems mentioned the author proposes the use of a classification, ascribed to C. C. Nikiforoff, which divides soils into (1) zones, (2) combinations, (3) associations and associates, and (4) phases.

"The soil zone (based on genetic type of the phytomorphic soils).—The highest category is the zone. The zones are the recognized soil zones of the world, and the additional zones or subzones which may be established. . . . . The names of the zones are determined from the common morphological characters of the typical zonal soils usually exhibited in the well-drained or phytomorphic associates. . . .

"The combination (based on the physiographic regions within the zone).—All soils developed in a given physiographic region constitute a combination. A zone may cross a number of physiographic regions and each physiographic region within a soil zone will have its own combination of soils. . . .

"The association (based on geological parent material).—An 'association' includes the genetic soil types or 'associates' found in association on a given parent material. In each combination (or physiographic region) within a given zone, soils are developed on different parent materials, and although the well-drained members have much in common there may be distinctive differences due to the parent materials which are recognized in all soil mapping. . . .

"The associate (determined by relief and local environment).—The difference in the morphological characteristics of the associates which are the basis of the subdivisions of an association are largely the result of the topographic conditions or 'macro-relief' which have been responsible for the changes in the soil climate. Three distinct types of associates are recognized, the oromorphic associate, the phytomorphic associate, [and] the hydromorphic associate.

"The 'oromorphic associate,' when present, is characterized by being locally arid. . . . The 'phytomorphic associate' of any association is the normal soil of the zone developed on the geological parent material which comprises the association. It is the result of the equilibrium reached by a soil in the well-drained position for the time the parent material has been under the influence of the climate and the plant cover. . . .

"The 'hydromorphic associate' of each association is characterized by being locally moist in comparison with the phytomorphic associates. The hydromorphic associates are under the influence of hydromorphism, the extreme characters of which are evidenced by the presence of a glei-horizon, reduction processes, and mottled subsoil colors. Such soils are found occupying the low positions in relation to relief.

"*The phase (or subdivision of an associate).*—In detailed mapping where finer distinctions are noted the variations of an associate may be separated out as phases."

Method and purpose of a soil survey, W. DeYoung (*Montana Sta. Circ. 139 (1932), pp. 11, figs. 6*).—The circular presents a general, more or less popular account of the reconnaissance and detailed forms of soil survey, the specific topics considered being types of soil survey, basis of classification, field methods of classification, chemical analyses, uses of the soil survey, and land utilization.

A new type of hydrometer for the mechanical analysis of soils, A. N. Puri (*Soil Sci., 33 (1932), No. 4, pp. 241–248, figs. 2*).—The instrument described in this contribution from the Irrigation Research Laboratory, Lahore, India, consists of a short bulb (6–8 cm long) and a long, thin stem (50–60 cm long). The readings are taken with a special device accurate to the fraction of a millimeter. The tip of an ordinary pin attached to a thin brass cap fitting on the top of the hydrometer stem forms the reference point, and the readings are taken against the graduations on a burette tube held in a special clamp. The mouth of the burette tube is closed with a brass cap having a hole in the middle through which the hydrometer stem is passed. The edges of the hole are sharpened to prevent friction that might hinder the free movement of the hydrometer.

"All that is necessary is to tap the burette tube gently before taking a reading. This brass cap has also a pin attached to it which is required for fixing the position of the burette tube with respect to the water surface. The tube is gradually lowered till the pin point just makes contact with the water surface. The burette tube is held in brass clamps, which keep it in position, at the same time allowing it to be pushed up or down. The brass clamps are fixed to an iron rod attached to an iron cap that can cover the top of the sedimenting cylinder, and has a hole in the middle to allow the free movement of the burette tube. . . . To avoid parallax the graduations on the burette tube should be all round the circumference as in the Charlottenburg type."

An experimental comparison of this form of the hydrometer method (E. S. R., 57, p. 710) with the standard pipette method gave results agreeing, especially in the case of the finer fractions, rather well, and led to the conclusion, among others, that since "half a dozen hydrometers can be conveniently handled for routine work," this form of the hydrometer method "should prove the quickest means of mechanical analysis, giving directly the summation percentage curves for soils, the results being directly comparable to the pipette method."

An improved method of measuring soil color, C. F. Shaw (*Soil Sci., 33 (1932), No. 3, pp. 183–185, pl. 1*).—By reason of their granular character, and even when they are carefully smoothed, soils give color values that are very difficult to match because of the diffusion of light reflected from the surface of the many particles, together with the shadows in the recesses of the soil. The author, from the University of California, proposes a method of preparing and mounting the soil sample that provides for rotating the soil as the central part of the disk area, whereby a mixed or composite light effect and color value very similar to that of the rotating color disk is obtained, permitting a

much easier matching of the colors. In part, "the soil is made into a suspension in about three times its volume of water, and is mixed until well dispersed. . . . The soil 'mud' is then painted onto white blotting paper, . . . making sure that the blotting paper is so well coated that it does not show through the soil. When the soil-coated paper is thoroughly dry a disk 2 or 2.5 in. in diameter is cut out, a hole punched in the center, and this disk mounted on the face of the color disk and fastened down by the lock nut. . . . When rotated the soil disk develops a smooth color effect similar to that of the color disks and a good match in color values is readily obtained."

It is noted that most soils adhere well to the blotting paper. Sandy soils presented the most difficulty, though some heavy clays showed a tendency to crack, the shadows in the cracks then darkening the shade. Attention is further drawn to the fact that, although the color thus measured "may not truly represent the color effect of the granulated or broken soil surface as seen in the field," it is both a natural and a consistently reproducible effect, and provides a definite comparative measurement.

A study of soil structure, R. E. STEPHENSON and A. R. MARQUARDT (*Jour. Amer. Soc. Agron., 24 (1932), No. 3, pp. 167–182*).—This contribution from the Oregon Experiment Station reports a preliminary investigation into the question of the applicability of certain procedures in a general study of soil structure.

The Bouyoucos method (E. S. R., 63, p. 421) of measuring soil permeability to water appeared satisfactory as a percolation method. The method was found sufficiently sensitive to distinguish soil types showing marked differences in behavior in the field, and to distinguish appreciable differences between surface and subsoils. The method also distinguished the effects of treatments and different rates of treatment rather consistently, and these results also corresponded with the field behavior of the soils.

The plasticity indices appeared to indicate significant structural differences. The more desirable soil structures were "associated with a low plastic range and the refractory soils with a high plastic range." There was found little or no correlation between soil structure and the amount of colloidal material.

Of chemical treatments it is stated that these "may prove helpful to improve soil structure in the field, but the feasibility of such improvement can be determined only by field trial."

Soil profile studies.—IV, Morphological and chemical evidence of podzolization, J. S. JOFFE (*Soil Sci., 33 (1932), No. 3, pp. 217–237, pl. 1, figs. 4*).—Continuing this series (E. S. R., 66, p. 118), the author takes up the morphological and chemical characteristics of the various horizons of a typical podsol profile. Each horizon is discussed individually, with reference to unsaturation, base exchange capacity, sesquioxide, silica, and alkaline earth base content. The distribution of phosphoric anhydride and manganese through the profile is also considered.

[Soil Survey Reports, 1928 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1928, Nos. 16, pp. 32, fig. 1, map 1; 17, pp. 32, pls. 2, fig. 1, map 1; 18, pp. 29, fig. 1, map 1; 19, pp. 24, fig. 1, map 1*).—These surveys were made with the cooperation, respectively, of the University of Nebraska and the Kansas, Maryland, and Iowa Experiment Stations.

No. 16. *Soil survey of Cedar County, Nebraska,* R. C. Roberts et al.—Cedar County occupies an area of 467,200 acres of which about 80 per cent is upland, the remainder, terrace, alluvial, and flood plain lands, in the northeast corner of Nebraska. "Drainage channels reach all parts of the upland, leaving no large flat undrained plain remnants or depressions."

The soils mapped and described consist of 40 types, included in 17 series, of which the most important in areal extent are Moody silt loam, which covers 24.1 per cent of the total area, and Moody very fine sandy loam, which amounts to 23.2 per cent.

No. 17. *Soil survey of Johnson County, Kansas*, E. W. Knobel and R. H. Davis.—Topographically, the 302,720 acres constituting this area, located in the northeast section of the State, are divided into "(1) the hilly areas along the larger streams, (2) the rolling or gently undulating uplands on the watersheds and along the small streams, and (3) the alluvial valleys including the terraces."

Of soils found, 14 series inclusive of 21 types are listed. The Labette and Summit silt loams constitute, respectively, 28 and 18.1 per cent of the total area.

No. 18. *Soil survey of Anne Arundel County, Maryland*, S. W. Phillips et al.—The county consists of 268,160 acres near the center of the State, and "includes level or rolling uplands and interstream areas but is very hilly adjacent to the main streams." Most of the upland section is well drained.

The present report lists 8 series represented by 17 types of soils, of which the Sassafras and Collington fine sandy loams have the greatest extent, 16.3 and 23.2 per cent, respectively, of the entire county.

No. 19. *Soil survey of Pocahontas County, Iowa*, A. M. O'Neal and R. E. Devereux.—This area, located in northwest Iowa, comprises 368,640 acres of the section covered by the late Wisconsin drift sheet. Surface and internal drainage, with the inclusion of some artificial drainage, were found adequate.

The soils are classified in 12 series including 14 types. Clarion loam with 43.2 per cent, Webster silty clay loam with 28 per cent, and Webster loam with 18.4 per cent of the total soil area are the types of greatest areal importance.

[Soil researches of the Rhode Island Station] (*Rhode Island Sta. Rpt. [1931], pp. 42–44, 46, 49–52, 55*).—Work noted under this head includes investigations on the comparative value of various sources of organic matter for the soil; the efficiency of fertilizers and manures; the liming of acid soils and the effect of such treatment on the growth of several ornamental shrubs; the correlation of yields with the concentrations of nitrates in the soil; the relation between soil nitrate concentrations and the nitrate, ammonia, amide, and amino nitrogen contents of the juices of crop plants; the effects of various extractable fractions of the components of buckwheat roots upon the growth of lettuce; a method for estimating the available phosphorus in soils; and the determination of the availability of ammoniated and other phosphates by the growth of oats, millet, and turnips in pot cultures.

The chemical composition of the muck soils of New York, B. D. Wilson and E. V. Staker (*New York Cornell Sta. Bul. 537 (1932), pp. 26, figs. 13*).—Ash, silicon, iron, aluminum, nitrogen, phosphorus, potassium, sulfur, calcium, magnesium, and inorganic and organic carbon were determined in samples of muck soil collected from the principal cultivated areas of New York State, together with the reaction of the soils. The soils which were sampled had never been cultivated nor fertilized and were representative of adjacent soils under cultivation. The soils examined were found so low in mineral matter and so high in organic carbon as to indicate that the soils were composed largely of organic matter.

The phosphorus, potassium, and magnesium contents of the soils were small, the nitrogen and calcium contents in most cases large. The low content of inorganic carbon, however, indicated that calcium was not present in the form of carbonate to any considerable extent.

The greater proportion of the soils were found to be acid, and a positive coefficient of correlation between the pH values and the quantities of calcium found indicated a high acidity to be accompanied by a low calcium content. "This relationship was not found to persist for individual soil unless the quantity of calcium in the soils was relatively low or relatively high. Thus the reaction of a muck soil is not necessarily a measure of the calcium which the soil contains nor an indication of its need for agricultural lime."

The chemical composition of surface soils was found similar to that of the corresponding subsoils. The surface soils, however, were found usually to have a slightly higher ash and a lower organic matter content.

The origin, nature, and importance of soil organic constituents having base exchange properties, J. MITCHELL (*Jour. Amer. Soc. Agron., 24 (1932), No. 4, pp. 256–275*).—Following a condensed review of previous work in this field, the author of this contribution from the Wisconsin Experiment Station discusses the results of an experimental examination into the mass action equilibrium constants of the soil organic exchange complexes and their significance, including a determination of the calcium-magnesium constants and the effect of extractions with organic solvents; the proportion of total base-exchange capacity due to soil organic matter; the probable nature of organic substances involved in base-exchange reactions; the lignin, "lignin-humus," and the effect of weak acid hydrolysis; and the effect of extractions with 0.5 N solutions of bases.

The calcium-magnesium equilibrium constants for the organic base-exchange reactions were found not to have the same value in all soils. This fact is considered to indicate that more than one compound is responsible for base-exchange reactions in soil organic matter. The proportion of the exchange capacity of mineral soils due to organic matter ranged from 41 to 65 per cent of the total in the soils studied. The organic matter of different soils differed greatly in base-exchange capacity.

Extraction with common organic solvents appeared neither to dissolve nor otherwise to affect the base-exchange material of soil organic matter. The organic base-exchange complexes could be destroyed by ignition at 350° to 400° C., apparently without affecting the inorganic exchange material. Two fractions of soil organic matter were found to have base-exchange properties, namely, the hemicellulose-containing fraction and the lignin-humus fraction. The latter fraction seemed the more important, since it appeared to give to the soil organic matter its more or less permanent base-exchange properties. In the peats studied, 60 to 80 per cent of the base-exchange capacity was found due to this fraction.

"It is suggested that lignin, or a derivative of very similar nature, is the constituent responsible for the base-exchange reactions of the lignin-humus fraction of soil organic matter. Supporting this possibility is evidence that there appears to be no relationship between the nitrogen content of the lignin-humus fraction and its base-exchange capacity, suggesting a nitrogen-free substance as the active constituent; that lignin prepared by a chemical method has base-exchange capacity; and that the calcium-magnesium equilibrium constant of the lignin-humus material is similar to that found for the prepared lignin."

Replaceable bases in the soils of southeastern Minnesota and the effect of lime upon them, C. O. ROST and J. M. ZETTERBERG (*Soil Sci., 33 (1932), No. 4, pp. 249–277, fig. 1*).—Report is made in this contribution from the Minnesota Experiment Station upon an investigation in which replaceable bases were determined by 0.05 N hydrochloric acid extraction, replaceable hydrogen by

the ammonium hydroxide-ammonium chloride buffer method, and the H-ion concentration by electrometric means.

The base capacity ranged from the very low figure, 6.7 m. e., on the loamy sand to a high figure of 48 m. e. found in the case of the silty clay loam. On all fields except the loamy sands and one silty clay loam the moisture equivalent was found almost identical with the number of milliequivalents in the base capacity per 100 g of soil. Any marked textural change was reflected in the base capacity of the soil. "The replaceable bases determined in these soils were calcium, magnesium, and hydrogen. The calcium was from three to six times as great as the magnesium, and together they average 60 per cent of the total replaceable base. The magnesium appeared to be less affected by varying amounts of hydrogen present.

"The content of replaceable base decreased from the surface downward. The decrease was about 2 m. e. of hydrogen and 2 of calcium in the second 6 in., and on soils developed on outwash and glacial drift there was a similar decrease in the second foot. On soils developed on loess there was somewhat less decrease below the first 6 in. The magnesium remained more or less constant throughout the profile. The degree of unsaturation in the surface soils varied widely but was generally high, averaging about 40 per cent. In most cases it was equally high in the second foot, but in the third foot there was a marked decrease.

"The relationship of unsaturation to hydrogen-ion concentration was only general. Usually the more unsaturated soils had a lower pH. In the range of hydrogen-ion concentration from a pH of 5.8 to a pH of 6.2 there were wide variations in unsaturation. When the pH approached the neutral point the unsaturation was rather uniformly low. An application of 8 tons of limestone an acre increased the total base capacity on four of the five experimental fields. Upon only one . . . did an amount less than 8 tons produce any increase, but on this the 4-, 3-, and 2-ton rates were effective. Limestone increased the replaceable calcium and magnesium somewhat in proportion to the amount applied, and in most cases the increase in calcium and magnesium exceeded the decrease in replaceable hydrogen. On fine-textured soils it was necessary to apply at least 3 or 4 tons of finely ground limestone before any definite effect on the exchange complex could be observed, but on the coarse-textured soil the effect of 1 ton was discernible. The lime application decreased the degree of unsaturation more or less in proportion to the amount applied. On the loamy sand 8 tons of limestone caused complete saturation with a pH of 8.3.

"The penetration of lime as observed by its effect upon the replaceable bases was not detected below the surface 6 in. except on the loamy sand. There it appears to have reached to the lower part of the second foot.

"The buffer capacity of these soils was closely correlated with the exchange capacity. More lime was required to produce an effect on fine-textured soils with high capacity than to produce an equal effect on coarse-textured soils with a low exchange capacity.

"The use of the degree of unsaturation as an indication of the crop response to be expected from lime is of doubtful value. If the soil is more than 40 per cent unsaturated the chances are that there will be an increase from liming in about 85 per cent of the cases. However, there were a considerable number of soils having rather low unsaturations which gave quite as great a response to lime."

Behavior of potassium and sodium during the process of soil formation, H. Jenny (*Missouri Sta. Research Bul. 162 (1931), pp. 62, figs. 26*).—"An attempt has been made to approach the important but complex problem of soil

formation from a systematic and quantitative angle." Two constituents—potassium and sodium—were selected, their behavior during soil development being studied both from a theoretical and from an experimental viewpoint.

Following a brief introduction and outline of the plan of investigation, the bulletin takes up the behavior of sodium and potassium in colloidal systems, analyzing first theoretical considerations referring to the nature of the potassium and sodium ions, the hydration of ions, the structure of the colloidal complex, and the mechanism of adsorption; second, experimental work on the effect of colloidal complex, the influence of concentration of salt, the effect of dilution, the influence of varying pH values, the effect of anions, the effect of cations, the effect of temperature, and the influence of lime. In the remaining half of the bulletin are treated the distribution of exchangeable potassium and sodium in the soil profile and relationships between potassium and sodium in total analyses of soil profiles, these sections being followed by a general discussion of the different leaching of potassium and sodium in soils, a bibliography of 93 items, and a general summary as follows:

"On the basis of the inherent properties of the K and Na ions, which bring about a difference in their hydration, it has been suggested that under comparable conditions K is better adsorbed than Na, while Na is better released than K. Elaborate experimental studies on ionic exchange with K and Na furnish convincing evidence that the above principle applies to all soil colloids so far investigated.

"In applying these results to the study of K and Na in natural soil profiles, soils were divided into two main classes: Class I, soils having predominantly foreign cations (Ca, Mg) in the soil solution; Class II, soils having considerable amounts of K and Na in the soil solution. For the distribution of exchangeable K and Na in the various horizons of soils belonging to Class I, the following theorem was advanced: The horizon with the smallest amount of K and Na has a wider K/Na ratio than the horizon having the largest amount of K and Na. The profile analyses (exchangeable bases) found in the literature support this theorem.

"About 200 total soil profile analyses from all parts of the world were inspected as to the existence of quantitative K-Na relationships using the K-Na theorem as a guide. For the study of these profiles the sum of K_2O+Na_2O was related to Al_2O_3, calling the quotient ba_1. A leaching factor (β) was formed by comparing the lowest ba_1 value in the profile (leached horizon) with the ba_1 value of the parent material. Similarly, a shifting factor (μ) was calculated by comparing the K/Na ratio of the leached horizon with that of the parent material.

"The nature of the parent material decidedly affects the rate of leaching and shift of K and Na in the profile. Soils of Class I (containing carbonates) have lower β-values and higher μ-values than soils of Class II (without carbonates). In other words, the leaching of K and Na and the widening of the K/Na ratio is most pronounced in soils containing $CaCO_3$.

"Both leaching and shifting values are sensitive indicators of the climatic factors operating during soil formation. In podsolized soils and chernozems both values differ distinctly. The chernozems have β values which approach the magnitude one, indicating little loss and translocation of K and Na. In podsolized soils leaching and widening of the K/Na ratio is much more pronounced. Analysis of the climatic soil types—podsol, yellow-red soil, and laterite shows distinctly that β becomes smaller as one goes from north to south, while μ has the tendency to become greater. The intensified weathering of subtropical and tropical regions results in greater losses of K and Na, and in a more pronounced widening of the K/Na ratio in the leached horizon.

"Comparison of the K/Na ratio of leached and accumulation horizons reveals a marked tendency for the K/Na ratio of the leached horizon to be wider. This behavior of K and Na is most pronounced is soils of Class I (carbonate soils) and is in line with what might be expected if ionic exchange reactions play an important rôle in soil formation.

"The old observation that K accumulates in sedimentary rocks while Na is washed out and concentrates in the ocean is shown to be valid also for the horizons in soil profiles. This behavior is explained on the basis of differences in ionic properties of the two ions which dominate the various factors acting during weathering."

The influence of alkali salts on nitrification in some Indian soils, J. H. Walton (*Indian Jour. Agr. Sci., 1 (1931), No. 4, pp. 480–494*).—Following a rather inclusive review of previous work on the influence of sodium chloride, sulfate, and carbonate upon nitrification in soil, the author reports experiments in which 30 mg of nitrogen were supplied in the form either of mustard press cake or of ammonium sulfate for each 100 g of soils to which had been added various small proportions of the "alkali" salts above named.

In a Pusa soil, 0.2 per cent of sodium carbonate showed toxic effects for two weeks, after which nitrification caught up to and, with ammonium sulfate, surpassed that of the control, but 0.3 per cent was distinctly toxic. In the (acid) Jorhat soils used, the initial doses of sodium carbonate, by lowering the acidity, increased nitrification, but 0.3 per cent suppressed the nitrification of cake, and 0.4 per cent that of ammonium sulfate. In a Kalol soil, initial depression was followed by stimulation, when 0.5 per cent of sodium carbonate was added; 0.75 per cent retarded the nitrification of ammonium sulfate, and entirely suppressed that of cake. There was some stimulation of nitrification in the Chinsurah soil tested when sodium carbonate was added in quantities up to 0.2 per cent; 0.5 per cent had little effect, and even when 1 per cent was added nitrification was vigorous, its addition producing about two-thirds of the quantity of nitrate found in the control soil.

Except in the Pusa soil, 0.2 per cent of sodium sulfate showed some toxic effect, which increased as the dose of sodium sulfate increased. In the last-named soil, the initial depression caused by the addition of 0.2 per cent, and even of 0.5 per cent, lasted only a short time, after which nitrification proceeded as vigorously as in the control. One per cent of sodium sulfate prevented nitrification for eight weeks, after which nitrate accumulation was rapid.

Sodium chloride, 0.2 per cent, depressed nitrification, except that of ammonium sulfate in Pusa soil, where its influence was slight; 0.1 per cent depressed the nitrification of cake both in Pusa soil and in a Jorhat soil.

Nitrate accumulation under various cultural treatments, M. C. Sewell and P. L. Gainey (*Jour. Amer. Soc. Agron., 24 (1932), No. 3, pp. 221–227, figs. 2*).—Experiments from the Kansas Experiment Station are here noted.

The greatest losses of nitrogen occurred with those tillage treatments which caused the largest amount of nitrate development. The relationship between nitrogen lost and nitrate development in the first foot was quite definite, showing, when calculated statistically, a correlation coefficient of 0.856±0.0466.

The carbon losses were on the whole greater for the early tillage treatments than for the late. Correlation of carbon losses with total nitrogen losses was not as close as in the case of nitrogen loss and nitrate development. With minor exceptions, however, the trends were identical.

Nitrate accumulation under various cultural treatments, M. C. Sewell and P. L. Gainey (*Jour. Amer. Soc. Agron., 24 (1932), No. 4, pp. 283–289*).—The

authors of this contribution from the Kansas Experiment Station report work on three series of field plats covering a period of five years. Among other observations recorded was that of a marked accumulation of nitrates under conditions of relatively low soil moisture. "This would indicate that under relatively dry climatic conditions sufficient nitrates may be formed for crop production, provided there is an ample supply of raw material for the nitrifying organisms to work with and the removal of nitrates by weeds is prevented by adequate cultivation." A favorable effect of cultivation between harvest and seeding was also made evident.

Organic matter changes in dry farming regions, M. C. SEWELL and P. L. GAINEY (*Jour. Amer. Soc. Agron.*, *24* (*1932*), *No. 4*, *pp. 275-285*).—The authors report as a contribution from the Kansas Experiment Station a study of the effects of some cultural treatments upon the carbon and nitrogen content of semiarid soils. Numerical data covering a number of years' experiments are considered to indicate the need for returning organic residues to the soil, but on account of the high carbon-nitrogen ratio of the straw (the principal residue available for the lands under consideration), it is desirable to turn it under immediately following harvesting and to pack the soil in order to bring about as rapid a decomposition as may be.

A preliminary investigation on determining the "available" phosphorus in Saskatchewan soils, J. MITCHELL (*Sci. Agr.*, *12* (*1932*), *No. 6*, *pp. 346-351*, *fig. 1*).—The author made a slight modification in the Truog method (E. S. R., 64, p. 312) for estimating available phosphate, using an extractant solution made by dissolving 10 g of potassium hydrogen sulfate in a liter of water, and diluting 34 c c of this solution, with the addition of 5 g of potassium sulfate, to 1 liter. This extractant was found to be buffered at pH 3.

The Truog procedure thus modified was used in a study of the correlation between increased yields following phosphating and the available phosphorus of the untreated soil. The conclusion that "for soils lighter than clays, where the 'availability' of the phosphorus is below 20 parts per million as found by this method, large increases in grain yields may be expected from phosphate treatments of the soil" was reached. "With an availability of from 20 to 40 parts per million a response is still probable, while at 50 to 60 parts per million available phosphorus, the point is reached where little or no response is likely." A wide variation in the availability of the phosphorus in Saskatchewan soils was noted.

The laws of soil colloidal behavior.—VIII, Forms and functions of water, S. MATTSON (*Soil Sci.*, *33* (*1932*), *No. 4*, *pp. 301-323*, *pl. 1*, *figs. 6*).—The present paper in this series from the New Jersey Experiment Stations (E. S. R., 66, p. 813) is an analysis of the general problems of the status and behavior of the water content of the soil.

"The combined or constitutional water represents the internal water of the material in combination with the individual molecules in the form of hydrous oxides of silicon, aluminum, iron, and their combinations.

"The molecularly attracted water is represented by the hygroscopic moisture. This water is held by powerful forces which are manifest by the heat of wetting and by a contraction of volume. This water exists in a very thin film which apparently does not exceed 4 or 5 mμ in thickness, which corresponds to the range of molecular attraction. The quantity of water thus adsorbed by the soil is a function of the surface and is independent of the nature and quantity of exchangeable cations. Where a relationship between the heat of wetting on the one side and the composition and exchange capacity on the other side was observed, it must be remembered that the particle size and hence the surface varied accordingly. . . . The lower heat of wetting . . .

for Na-saturated colloids may be ascribed to the slowness with which such materials wet.

"Soil colloids imbibe greatly varying quantities of water depending upon (a) their composition or more directly upon their exchange capacity; (b) the nature of the exchangeable cations; (c) the charge of the particles; (d) the position of their isoelectric point if amphoteric or (e) their ultimate pH, i. e., the strength of their acid group; [and] (f) the concentration of free electrolytes and the valence of the ions, both according to the Donnan equilibrium. This imbibition is obviously therefore a function of an ionic condition of the colloid; in other words, of a colloidal ionogen. It is an osmotic imbibition brought about by the dissociation of diffusible ions by the colloidal particle. This forms the colloidal micelle consisting of the particle, the ion atmosphere, and the osmotically imbibed water.

"The relationship between the applied pressure and the water content indicates that the concentration of the micellar ions increases rapidly in the direction of the surface. This theory leads to the following deductions: The free electrolyte must be more concentrated in the outside than in the inside or micellar solution. The pH of a negative suspension must be lower than that of its extract. The pH of a positive suspension must be higher than that of its extract. The concentration of any ion in the solution removed from a colloid at high pressures must be lower than its concentration in the solution filtered off without pressure. The potential difference between the gel and its extract must increase as the water content of the gel decreases."

Lysimeter investigations.—II, Composition of rainwater at Geneva, N. Y., for a 10-year period, R. C. COLLISON and J. E. MENSCHING (*New York State Sta. Tech. Bul. 193 (1932), pp. 19*).—In continuation of lysimeter investigations (E. S. R., 64, p. 422), data collected during 10 years at Geneva on composition of rain water show an average of 9 lbs. of fixed nitrogen, over 41 lbs. of sulfur, and about 16 lbs. of chlorine per acre annually in the precipitation at that place. It is stated that over 86 per cent of the fixed nitrogen is in form of ammonia, the remainder being in nitrate form. The nitrogen in the precipitation is considered comparatively unimportant, but the amount of sulfur "is sufficiently large to be quite important in sulfur economy in soils." The amount of chlorine "is very small when compared with the amounts of this element removed by crops and drainage water." It is noted that bicarbonates are found in considerable amounts in the precipitation, varying from 12 to 92 lbs. as HCO_3 per acre annually. "All constituents vary widely in amount for the various years, and these amounts bear very little relation to the amount of rainfall."

A study of the amount of sediment carried by runoff water, H. J. HARPER and H. F. MURPHY (*Okla. Acad. Sci. Proc. [Okla. Univ.], 10 (1930), pp. 114–117*).—The streams studied were found to contain at flood stage less than 1 per cent of total solids in suspension when the rate of flow was 3 ft. per second or less. Water flowing across cultivated fields carried much larger quantities of sediment, but this was quickly dropped when the velocity of the water decreased. Water coming from terrace outlets contained on the average less total solids in suspension than streams at flood stage. "In this study it was found that run-off water reduces the amount of erosion to less than 8 per cent of that occurring on unterraced land."

The relations among fertilizer treatment, soil moisture, organic matter, and yield of vegetable crops, W. B. MACK and A. P. TUTTLE (*Jour. Amer. Soc. Agron., 24 (1932), No. 3, pp. 182–202, figs. 2*).—Determinations of the percentages of soil moisture and soil humus made on experimental plats during the growing seasons of 1928 and 1929 were studied in relation to crop yields

and fertilizer treatments of the 12-year period of the work on certain of the plats of the Pennsylvania Experiment Station.

The only fertilizer treatments which had a significant influence on soil moisture and organic matter were heavy applications of barnyard manure. Apparantly there was no association between the amounts of the different commercial fertilizers and the percentages of soil moisture or of organic matter.

The crop yields were correlated to a significant degree with soil moisture without regard to the various fertilizers applied. The relative soil moisture was found one of the very important conditions influencing crop yields, "possibly the most important." The percentages of soil organic matter and moisture were correlated to a significant degree with each other and with crop yields. The correlation between the yields of all crops during the period of the experiment and the average percentages of soil moisture was found greater than that between the average percentages of soil moisture in a particular season and the yields of the crops grown in the same season. "This indicates that the relative crop yields and the soil moisture were characteristics of the plats studied which did not change greatly in their relation to each other during the period of the experiment."

The topography as it affected surface drainage appeared possibly to be a physical feature which might have had an important influence on the moisture content of the plats.

It is considered that "causal relationships between the various conditions" can not definitely be set down; but "it may safely be assumed . . . that differences in soil moisture brought about differences in crop yield. The degree of association between these two factors, as shown by the coefficient of correlation between them, indicates that the influence of natural differences in soil moisture in determining the crop yields was very great."

Effects of stable manure and certain fertilizers on the microbiological activities in virgin peat, S. C. Vandecaveye (*Soil Sci., 33 (1932), No. 4, pp. 279–299, figs. 3*).—For the purposes of the investigation reported in this contribution from the Washington Experiment Station, a virgin woody-sedge peat was treated with unsterilized stable manure, sterilized stable manure, wheat straw, superphosphate, sodium nitrate, and lime. The numbers of microorganisms were determined at regular intervals by means of direct microscopic counts and by counts of colonies developing on plates prepared with selective culture media. Their activities were ascertained periodically by determinations of carbon evolved as the dioxide and of nitrogen accumulated as nitrate and as ammonia.

The addition of stable manure, or wheat straw to which sodium nitrate had been added to equal the nitrogen content of the manure, increased both carbon dioxide evolution and also the numbers of the microorganisms in the various groups, except in the cases of the cellulose-decomposing bacteria and the Azotobacter. The accumulation of nitrates was also increased but not that of ammonia. The microflora of unsterilized stable manure had no perceptible effect upon the numbers in the various groups of microorganisms in the soil or upon their activities. It was indicated that the beneficial effect of stable manure on the microbiological activities of the woody-sedge peat was derived from the readily available carbon and nitrogen compounds in the organic matter of the manure. Stable manure and wheat straw gave comparable results.

The addition of superphosphate or sodium nitrate caused no material increase in the total number of microorganisms or in numbers in the various groups of microorganisms, and had no marked effect upon their activities in the soil. The addition of lime greatly stimulated the liberation of carbon dioxide, but did not cause any marked increase in total numbers comprising

the various groups of microorganisms. It seemed to benefit Azotobacter to the extent that their numbers remained constant in the soil. It was apparent also that it caused an increase in the percentage of readily available carbon compounds in the organic matter of the peat as shown by a change in relationship in numbers between groups of microorganisms in the direction of that existing in a fertile mineral soil.

Fertilizer investigations (*Louisiana Stas. [Bien.] Rpt. 1930–31, pp. 13–16, 17, 18–24*).—The report contains brief notes on results of fertilizer investigations conducted by A. H. Meyer and inclusive of experiments on the rate of aging of reverted phosphates, on newer sources of nitrogen, on sources of phosphorus, on home-mixed as against factory-prepared and high-analysis fertilizers, general fertilizer experiments, and rate of potash fertilization; of sodium nitrate experiments conducted by [F. A.] Mitchell; of soiling crops trials by Meyer; and of soil bacteriology investigations by M. B. Sturgis, the last-named work comprising investigations into the effects of additions of nitrogen on the decomposition of sugarcane trash under field conditions.

Experiments on rate and time of applying sodium nitrate, W. R. Rogers (*South Carolina Sta. Bul. 283 (1932), pp. 31, figs. 6*).—"Liberal quantities" of phosphorus and potassium having been applied just prior to planting, 100 lbs. of sodium nitrate increased the yield of seed cotton 222 lbs. per acre. Additional 100-lb. increments of sodium nitrate resulted in increases in yield of 201, 76, and 45 lbs. of seed cotton per acre, respectively. Where applications of sodium nitrate totaling 200 lbs. per acre were made to cotton at different stages of growth, the highest average yield was obtained from the application of one-half the nitrate at planting and one-half three weeks after chopping.

Returns in bushels of corn per acre from 100-lb. increments of sodium nitrate up to a total of 400 lbs. per acre were 7.6, 5.1, 3.8, and 2.2, respectively. The application of 200 lbs. of sodium nitrate to corn at various stages of growth returned the greatest increase, 14.7 bu. per acre, when applied while the corn was knee-high.

One hundred lbs. of sodium nitrate increased the yield of oats 18.5 bu. per acre, increases in yield due to 3 additional 100-lb. increments being reported as 13.5, 9, and 6.4 bu. per acre, respectively. Two hundred lbs. of sodium nitrate applied to oats on March 1 resulted in an increased yield of 29.5 bu. per acre, similar applications on February 15, March 15, and February 1 giving increases of 27.5, 27.4, and 25 bu. per acre, respectively.

The nitrogen outlook, J. G. Lipman (*Jour. Amer. Soc. Agron., 24 (1932), No. 3, pp. 227–237*).—In this review, presented at the Pennsylvania Soil Fertility Conference (E. S. R., 65, p. 301), the author estimates the annual loss of nitrogen from the cropped fields and pastures of the United States as totaling 7,400,000 tons. The estimated gains of soil nitrogen, from all sources, including applications of commercial fertilizers, are given as 4,700,000 tons, leaving a net loss of 2,700,000 tons.

"Too much emphasis can not be laid on the desirability of concentrating our efforts on land that will give economic returns. Such concentration or effort must of necessity involve higher yields per acre and, by the same token, greater net returns per unit of cultivated area. And here is where the nitrogen factor stands out in bold relief. Fixed nitrogen is cheap enough and abundant enough to justify its use as an aid toward a more prosperous agriculture. Since, as has already been noted, there is practically no limit to the quantity of fixed nitrogen that may be produced for agricultural uses, we should very seriously consider national and international inquiries in the domain of soil and plant science as a first step toward building more rational crop production programs."

Availability of rock phosphate as indicated by phosphorus assimilation of plants, J. W. Ames and K. Kitsuta (*Jour. Amer. Soc. Agron., 24 (1932), No. 2, pp. 103–122, figs. 3*).—Pot experiments with various crop plants are reported in a contribution from the Ohio Experiment Station, with numerous observations recorded in tabular and in graphic form.

With limestone and phosphate added to the soil at the same time, the phosphorus utilized by plants indicated a decreased availability due to increased basicity. This effect was more pronounced with rock phosphate than with superphosphate. Phosphorus assimilation from rock phosphate added to previously limed field soil was not affected to the same extent as when phosphate and limestone treatments were directly associated. The addition of limestone to an acid soil increased assimilation of phosphorus from the natural supply. The fineness of grinding appeared an important factor in the availability of rock phosphate.

Neither calcium nor magnesium assimilation was increased appreciably by rock phosphate, dicalcium phosphate, or dimagnesium phosphate, though the plants readily took up calcium or magnesium from the respective carbonates.

Registration, labeling, inspection, and sale of commercial fertilizers, 1931, F. B. Mumford and L. D. Haigh (*Missouri Sta. Bul. 308 (1932), pp. 31*).—This bulletin reports the usual fertilizer analyses (E. S. R., 65, p. 422).

AGRICULTURAL BOTANY

A study on utilizing organic matter as a source of carbon dioxide in field culture [trans. title], I. I. Samoilov (Samoilovy) (*Zap. Leningrad. Selsk. Khoz. Inst. (Mém. Inst. Agron. Léningrad), 5 (1928), No. 2, pp. 33–56, figs. 5; Eng. abs., pp. 54–56*).—Reporting details and tabulations of results from a study carried on at the station for acclimatization at Detskoe Selo in the hope of discovering a means of utilizing organic matter as a source of carbon dioxide for fertilizing purposes, the author states that the practicability of the scheme can hardly be doubted, though results were not uniformly favorable.

Studies on antagonism in acid nutrient solutions, A. Åslander (*Svensk Bot. Tidskr., 25 (1931), No. 1, pp. 77–107, figs. 13*).—In a continuation of the work previously noted (E. S. R., 67, p. 22), with intent to determine whether all salts in the solution are equally able to check the detrimental effect of the H ions on plant growth or if any one (and if so, which) has a more pronounced effect, barley was grown in water cultures. Two nutrient solutions were made up, differing in reaction (pH 4.0 and pH 6.75) though but little in chemical composition. The growth in these solutions and in dilutions of them was compared with growth in solutions of identical concentration made up of 75 per cent of the acid control solution and 25 per cent of salts including nitrates of potassium, sodium, calcium, and magnesium (nitrate series), phosphates of the same metals (phosphate series), and nitrates and phosphates of potassium, calcium, aluminum, and trivalent iron (valence series). In a fourth group (absorption series) the neutralization of the acid solutions and the absorption of ions by the plants was studied. A system producing a constant flow of nutrient solution through the culture vessels was used. The phases and developments of the experimentation are detailed with deductions.

Are humic acids injurious to plant growth? [trans. title] A. Åslander (*Nord. Jordbrugsforsk., 1930, No. 4, pp. 297–312, figs. 4; Eng. abs., pp. 309–311*).—Having deduced (E. S. R., 67, p. 22) that acid soils, generally believed to be inferior in crop production to neutral soils, are rendered well suited for crop plants when dressed with farm manure, and, above, that in water cultures the addition of some salts largely overcomes the effect on plants of acid

reaction, the author presents an account of this investigation, which is admittedly of preliminary character, dealing with the influence of various acids on plants.

Gold barley from Svalöf was grown in water cultures, three plants per vessel (1 l), the experiments being made in triplicate. Weak nutrient solutions containing about 0.3 g of salts per liter were acidified with various acids, and changed twice each week. The data are detailed with results and discussion of related results, and views of other workers. Formic acid and acetic acid almost inhibited growth. Monobasic acids were more injurious than polybasic acids. Since the injurious effect of acidity depends on the kind of acid, this should be stated along with the pH figure.

The roots in the peat extract solutions strongly adsorbed colloidal particles, and it is thought that this layer around the roots may have facilitated the absorption of nutrients or influenced the growth in some other way. Humic acids are supposedly of less importance to plant life than the data from culture experiments with mineral acids have indicated.

Studies on the Coccaceae.—XVII, Agglutination as a means of differentiating the species of Streptococcus and Leuconostoc, G. J. HUCKER (*New York State Sta. Tech. Bul. 190 (1932), pp. 28*).—In continuation of studies on the Coccaceae (E. S. R., 64, p. 427), the author gives the results of investigations made from the standpoint of agglutination and agglutination absorption of the relationships of certain strains of the genera Streptococcus and Leuconostoc with particular emphasis upon the relationships of the saprophytic types.

It was found that agglutination and agglutination absorption were not useful in all cases in differentiating species of the streptococci, due in a number of instances to a decided strain specificity.

Of the saprophytic types, *S. lactis*, *S. cremoris*, and *S. thermophilus* appeared to be distinct from an agglutination standpoint. *S. glycerinaceus* was found to be closely related to and possibly identical with the gelatin liquefying streptococci. *S. faecium* serum was found to agglutinate strains of *S. lactis*.

The saprophytic streptococci did not give cross reactions with the more parasitic members of the genus. *L. dextranicus* and *L. mesenteroides* showed cross reactions to a high degree with sera prepared from many strains of parasitic as well as saprophytic streptococci.

GENETICS

Chromosome number and morphology in Nicotiana, I, II, M. L. RUTTLE (*Calif. Univ. Pubs. Bot., 11 (1927), No. 9, pp. 159–176, figs. 8; 11 (1928), No. 11, pp. 213–231, figs. 7*).—These two investigations were intended to develop knowledge as to chromosome number and morphology of the various Nicotiana species.

I. *The somatic chromosomes and non-disjunction in N. alata grandiflora.*—The somatic chromosomes in *N. alata grandiflora*, 18 in number, were separated into three groups on the basis of chromosome morphology. These are described.

II. *Diploidy and partial diploidy in root tips of Tabacum haploids.*—Three additional haploid *N. tabacum purpurea* and two haploid *N. tabacum* Cuba plants appeared the previous summer in the cultures. These are described and figured. The haploid *N. tabacum* plants were used for the study of somatic chromosome morphology. Briefer comparative studies were made of diploid *N. tabacum purpurea*. The results are detailed. True diploidy in haploid plants seemed to be limited to the root tips.

The progeny of a heteroploid (N. tabacum × N. rusbyi) × N. tabacum plant, D. Kostoff and J. Kendall (*Genetica [The Hague], 13 (1931), No. 1–2, pp. 17–26, figs. 32*).—The characteristics of and cytological behavior in a number of plants of the progeny are described.

Chromosome numbers in Althaea rosea, G. W. Burkett (*Science, 75 (1932), No. 1949, p. 488*).—Counts of chromosome numbers in *A. rosea* made at DePauw University indicated that its haploid number is 13.

Cytological observations of deficiencies involving known genes, translocations, and an inversion in Zea mays, B. McClintock (*Missouri Sta. Research Bul. 163 (1931), pp. 30, figs. 39*).—Corn plants with known genetic constitutions which arose from X-rayed pollen or X-rayed embryos were examined at the mid-prophase of meiosis, at which stage homologous parts of the chromosomes are synapsed and the chromosomes are about 10 times as long as at diakinesis. Thus comparatively short deficiencies in chromosomes could be measured, inversions detected, and the location of translocations between chromosomes determined cytologically.

The locus of the gene *lg* was placed at or near the end of the short arm of the *B-lg* chromosome, of *A* toward the end of the long arm of the *A-d_1-cr* chromosome and *Pl* in the long arm of the satellite chromosome, probably near the middle of this arm. The gene *Y* is between *Pl* and the satellite, while *R* lies in the long arm of the smallest chromosome. Deficiencies involving end segments of chromosomes, deletions, and inversions within a chromosome and reciprocal translocations between chromosomes were frequent, but no case of the attachment of a piece of one chromosome to the end of another was found. X-ray treatment sometimes produced alterations at two different points in the same chromosome. Evidence was obtained which suggests that the process giving rise to internal deficiencies and ring chromosomes is similar to that which produces translocations between chromosomes. See also previous notes (E. S. R., 65, p. 818).

Modification of Mendelian ratios in maize by mechanical separation of gametes, P. C. Mangelsdorf (*Natl. Acad. Sci. Proc., 17 (1931), No. 12, pp. 698–700*).—When homozygous sugary corn was pollinated with various fractions of pollen from heterozygous "high sugary" plants at the Texas Experiment Station, untreated pollen produced 94 per cent of sugary seeds (and 6 per cent of starchy), the fraction remaining in sieve 0.088 mm 93.3 per cent, passing through sieve 0.088 mm but remaining in sieve 0.074 mm 86.7 per cent, passing through sieve 0.074 mm but remaining in sieve 0.062 mm 41.8 per cent, and the fraction passing through sieve 0.062 mm 25.9 per cent. Conclusions were that "normal and tiny pollen grains can be partially separated by simple mechanical means. Separation on the basis of size also results in separation of starchy and sugary genes, furnishing direct evidence that, in this stock, the starchy : sugary genes are genetically associated with differences in size of pollen. The tiny grains, which function only rarely when in competition with normal grains, readily accomplish fertilization when competition with normal grains is reduced or eliminated."

Vivipary in maize, W. H. Eyster (*Genetics, 16 (1931), No. 6, pp. 574–590, figs. 3*).—Vivipary, the continuous development of the sporophyte in corn, is said to be determined by genetic factors and to be influenced strongly in its expression by environmental factors. Viviparous corn plants were described earlier (E. S. R., 62, pp. 31, 32) under the name "primitive sporophyte."

In studies at Bucknell University four genes for vivipary were identified by their linkage relations. The data indicated that the locus of Vp_1 is in chromosome II, of Vp_2 in chromosome VIII, of Vp_3 in chromosome III, and

that of Vp_4 is in chromosome I. The approximate locus of each gene for vivipary is indicated, and it is shown that the genes for reduced endosperm$_1$, reduced endosperm$_2$, scarred endosperm$_1$, and yellow endosperm$_1$ have their loci in chromosome VIII. By varying the environmental conditions of the maturing ears of plants homozygous and heterozygous for a single factor pair for vivipary, normal and viviparous phenotypes were produced in practically all possible numerical relations. These results are held to warn against the liberal assumption of multiple factors, with and without linkage, to account for unusual numerical ratios. The occurrence and nature of vivipary in plants are discussed briefly.

Heat-induced chlorophyll mutations in maize, F. H. Hull and E. F. Grossman (*Jour. Heredity, 23 (1932), No. 3, pp. 123–127, figs. 2*).—Heating dormant seeds of corn and teosinte (*Euchlaena perennis* and *E. mexicana*) to the sublethal point in experiments at the University of Florida often caused chlorophyll deficiencies in the plants. Efforts to produce similar results in common barley and peanuts failed entirely.

The nature and extent of hetero-fertilization in maize, G. F. Sprague (*Genetics, 17 (1932), No. 3, pp. 358–368, figs. 2*).—Heterofertilization in corn (E. S. R., 61, p. 216), according to genetic studies by the U. S. D. A. Bureau of Plant Industry, is due to the fusion of the egg and of the polar nuclei with sperms of unlike genotypes. It appeared that nondisjunction may be a minor factor in the production of these genotypically different sperms. Mixed pollinations gave results indicating that the genotypic differences usually are due to the participation in the fertilization process of sperms from more than one pollen grain. Heterofertilization was observed to occur with a frequency of about 1 seed in 80 in normal cultures and 1 in 4 in the high heterofertilization stock.

The association of semisterile-1 in maize with two linkage groups, R. A. Brink and D. C. Cooper (*Genetics, 16 (1931), No. 6, pp. 595–628, figs. 9*).—Semisterile-1 (E. S. R., 64, p. 428) when tested at the Wisconsin Experiment Station with genes in the nine linkage groups currently recognized in corn assorted independently of seven of them, but displayed linkage with certain genes in the *P–br* group and in the *B–lg* group. The observation of Burnham (E. S. R., 63, p. 218) that semisterile-1 plants at diakinesis form eight bivalent chromosomes and a group of four usually arranged in a ring was confirmed. The chromosomes embodied in the ring were shown by the linkage tests to be those corresponding to the *B–lg* and *P–br* groups. It is shown that semisterility does not affect crossing over in the *lg–v₄* region of the *b–lg* chromosome.

A test of the proportion in which the two classes of functional spores, o-normal and x-normal producing, are formed by semisterile plants led to the conclusion that within the limits of random sampling one-half the spores which can develop into gametophytes carry the normal chromosome complement, while the other half possess the chromosome configuration causing the sterility. The plants, termed x-normal, which are homozygous for the condition leading to semisterility, appear to be normal in form and fully sterile. The distribution of the chromosomes in the ring at the reduction divisions is described.

Linkage values in an interchange complex in Zea, M. M. Rhoades (*Natl. Acad. Sci. Proc., 17 (1931), No. 12, pp. 694–698, figs. 2*).—Results obtained at Cornell University in the genetic and cytological study of another semisterile (E. S. R., 63, p. 218), found by B. McClintock and called semisterile-4, provided evidence of the occurrence of a segmental interchange involving the *b–lg* and *pr–v₄* chromosomes in corn. The crossing over between ts_1, *b*, and *lg* with the

point of interchange in the *b–lg* chromosome amounted to 4, 22, and 47 per cent, respectively. The loci of *pr* and v_1 are 18 and 46 crossover units distant from the break in the *pr–v₁* chromosome. Cultures segregating for the genes *b* and *pr* and for the interchanged chromosomes showed about 31 per cent of crossing over between *b* and *pr*. The frequency of double crossovers between *b*, the point of interchange, and *pr* seemed to indicate the absence of interference in crossing over. See also a previous note by McClintock (E. S. R., 65, p. 818).

[The cytology and genetics of cotton], H. Emme (*Züchter, 4 (1932), Nos. 1, pp. 9–18; 2, pp. 39–49, figs. 3*).—This review of literature includes 172 titles concerned with the chromosome numbers in *Gossypium* and the inheritance of flower, fruit, seed, vegetative, and physiological characters in cotton.

The genetics of cotton, V-VII (*Jour. Genetics, 25 (1932), No. 3, pp. 261–291, pls. 3, fig. 1*).—Three additional contributions are presented (E. S. R., 65, p. 724).

V. *Reversal of dominance in the interspecific cross G. barbadense Linn. × G. hirsutum Linn. and its bearing on Fisher's theory of dominance*, S. C. Harland (pp. 261–270).—Crosses between crinkled dwarf, a mutation from sea island, and sea island cotton exhibited complete dominance of sea island, but in crosses with other Peruvian types dominance was disturbed slightly, producing in F_1 normals with a slight trace of crinkling and some variation of the crinkled class in F_2. Crinkled dwarf × upland gave an intermediate F_1 with dominance increasing in backcrosses of heterozygote to upland. Crosses involving crinkled and *Gossypium sturtii* gave F_1 strongly crinkled, whereas a heterozygous crinkled × *G. sanguineum* gave F_1 only slightly crinkled. While the behavior of crinkled in upland crosses was in accordance with the Fisher theory of dominance (E. S. R., 62, pp. 28, 512, 513), the process by which genes modifying dominance are thought to have become homozygous in Peruvian involves the assumption that normals descended from heterozygotes have replaced the original normal population. This assumption is thought to be improbable.

VI. *The inheritance of chlorophyll deficiency in New World cottons*, S. C. C^{hb}–c^{hb}, and C^{hc}–c^{hc}, all green deficients. Modifying factors appeared to affect *barbadense* and *G. hirsutum* was shown to depend upon three pairs of factors, probably inherited independently, which are designated as follows: C^{ha}-c^{ha}, C^{hb}-c^{hb}, and C^{hc}-c^{hc}, all green deficients. Modifying factors appeared to affect considerably the distribution of chlorophyll deficiency in the chlorophyll-deficient class, which embraced a range from completely lethal to fully viable. *G. barbadense* was found to carry only C^{ha}, *G. hirsutum* always carred C^{hb} but C^{hc} was found in all three phases of the gene, and *G. tomentosum* carried the combination C^{ha} with C^{hb}.

VII. "*Crumpled*": *A new dominant in Asiatic cottons produced by complementary factors*, J. B. Hutchinson (pp. 281–291).—This paper discusses the genetic behavior of an abnormal sterile or semisterile type (crumpled) which originated in the progeny of a cross between the wild cotton of the Sudan (*G. nanking soudanensis*) and a strain of *G. arboreum sanguinea*. Two complementary factors, *A* and *B*, causing abnormal development were demonstrated in Asiatic cottons. *A* was found in two strains of *G. nanking soudanensis* and *B* in 17 varieties of *G. arboreum*, *G. nanking*, *G. herbaceum*, and *G. obtusifolium*, and in a strain of *G. stocksii* from Sind. The existence of several modifying factors affecting the degree of expression of the crumpled character was also demonstrated. Neither *A* nor *B* could be correlated with any character in normal plants.

Pollen antagonism in cotton, T. H. Kearney and G. J. Harrison (*Jour. Agr. Research [U. S.], 44 (1932), No. 3, pp. 191–226, fig. 1*).—When emascu-

lated flowers of Pima and upland cotton were pollinated with about equal quantities of pollen of both types, they showed a marked degree of selective fertilization. The resulting populations contained a much higher percentage of homozygous than of heterozygous plants. These cottons were found to be highly compatible, as fertilization of the flowers of either type was affected about as readily by the unlike as by the like pollen. There were no differences in the viability of the two pollens, no evidence of selective survival at any stage after formation of the zygote, nor consistent evidence of a differential rate of growth of the tubes of the like and unlike pollen that would account for the selective action observed.

That the presence of the like pollen induces a reaction in the stigmatic tissues of such nature as to render them less suitable for the development of the unlike pollen seemed to be the only tenable explanation. Apparently the effect is extremely local or else individual pollen grains differ greatly in ability to withstand the unfavorable condition, since in all the experiments with pollen mixtures some ovules were fertilized by the unlike pollen. Experimental evidence of the localization of the reaction is reported. The inhibiting effect upon the unlike pollen appeared to take place only when the like pollen is intact and viable. Therefore, penetration of the stigmas by the tubes of the like pollen seems requisite to the setting up of the reaction, and this supports the assumption that the inhibiting substance is produced in the stigmatic or stylar tissue in response to a stimulus supplied by the tubes of the like pollen. The term "pollen antagonism" is suggested in order to distinguish the phenomenon from the selective fertilization observed in other plants and attributed to differential growth rate of the pollen tubes, conditioned by specific genes determining rates of growth. Little or no selective fertilization was observed between more nearly related forms, i. e., two families of Pima cotton differing only in a simple Mendelian character.

Intergeneric hybrids between Gossypium and Thurberia, S. C. Harland and O. S. Atteck (*Amer. Nat., 65 (1931), No. 699, pp. 380–382*).—The chromosome number of the so-called Arizona wild cotton *T. thespesioides* was determined by A. E. Longley as 13, the same as the cultivated Asiatic cottons *G. stocksii* and the wild Mexican cotton *G. davidsonii*. Thurberia was hybridized successfully at the Cotton Research Laboratory at Trinidad by the authors with *G. stocksii*, *G. davidsonii*, and with a cross between upland × sea island × sea island cotton. The pollen of the hybrids proved nonfunctional when applied to a wide range of types and the ovules of the hybrids responded similarly to pollen of the same types.

Studies on the breeding of cross-fertilizing plants.—I, Effect of mass selection in mangels, J. Rasmusson (*Hereditas, 16 (1932), No. 3, pp. 249–256*).—Selection experiments with Alfa and Barres mangels at Svalöf demonstrated the presence of enough genic differences within the strains tested to make mass selection effective in changing the progeny in either direction. Compared to other characters studied, the yield of dry matter was much more stable, varying only slightly even when other characters changed markedly.

Notes on the inheritance of flower and tuber colour in the potato, A. P. Lunden (*Jour. Genetics, 25 (1932), No. 3, pp. 339–358*).—Breeding work with potatoes at the State College of Agriculture for Norway furnished information on the inheritance of tuber and flower color.

Complete correlation between flower color and a certain type of tuber and stem color was found in Centifolia potatoes, which belong to a group having pigment deposited in the cork layer or skin of the tubers. Two factors, *A* and *B*, were found necessary to produce the tuber, stem, and flower color of Centifolia. *B* alone produces a faint reddish tuber color (designated *YR*) and a very weak

pigmentation in some parts of the stem and leaf and in the callus, but white flowers. *A* produces some pigmentation (anthocyan) of the inflorescences and also acts as an intensifier to *B* in tuber and stem and as complementary to *B* in flower color production, but *A* alone does not give flower color. Certain crosses with Centifolia strongly indicated that another factor *A'*, resembling *A* in effect, is present in some varieties. The *A* factor of Centifolia is shown to be complementary also to another flower color factor *F*, which is without effect on tuber color and probably all other plant characters outside the flower color.

Fairly good evidence was presented that the white tuber bearing variety Richter Jubel must be heterozygous for three different factors, *A*, *A'*, and *F*, which determine flower color, two being similar in effect and acting as complementary to the third. Their identity with factors similarly designated in progenies derived from Centifolia by self-fertilization or crossing was not definitely established but seemed very probable. *A* and *A'* of Richter Jubel also produce some pigmentation on the inflorescence. The varieties Sagerud and Edzell Blue probably carry the same factor for purple as the *P* factor of Salaman. *P* could not produce flower color, either alone or together with *A* or *A'*. With *B* of Centifolia, Sagerud *P* gives a very light blue flower color, and the tuber color is changed to a weak bluish purple when *A* is absent. The plants of this cross carry both *A* and *B* with *P*, developing dark bluish purple in the tubers, stem, and flowers. The variety Louis Botha carries two factors, *P* and *P'*, producing purple pigment. One of these is probably identical with the *P* factor of the other varieties. Gratiola is heterozygous for two complementary factors producing colored flowers, and its genetic constitution is either *Aaa' a' Ff* or *aaA' a'Ff*. Arnica was the only variety studied that seemed homozygous for all the factors needed for producing colored flowers.

A preliminary study of natural cross-pollination of rice in Ceylon, L. Lord (*Ann. Roy. Bot. Gard. Peradeniya* [*Ceylon Jour. Sci., Sect. A*], *11* (*1932*), *No. 4, pp. 339–342*).—Observations on two rice varieties in two climatically different districts in Ceylon showed natural crossing to vary from 0.34 to 0.67 per cent.

Inheritance of awn colour in wheat, B. S. Kadam and B. Nazareth (*Indian Jour. Agr. Sci.*, *1* (*1931*), *No. 6, pp. 663–670*).—The black awn color of Kala-Khapli 568 (*Triticum dicoccum*) and the red awn color of Bansi 103 (*T. durum*) were found due to two separate genes. *B* produces black color of awns and is epistatic to the gene *R*, which causes red awns. Both are dominant to white. *R* simultaneously causes red coloration of glumes and awns, while the action of *B* is confined to the awns.

Recurrence of a peculiar genetic recombination in the spike density of wheat, G. Stewart and L. W. Nelson (*Amer. Nat.*, *66* (*1932*), *No. 704, pp. 207–222, figs. 4*).—Study of F_3 progenies of Sevier × Ridit wheat at the Utah Experiment Station revealed peculiar inheritance of spike density. Three groups were found in numbers which suggested a 1:2:1 ratio. In mean spike density the homozygous dense progenies transgressed the range of the dense parent and the homozygous lax progenies transgressed the range of the lax parent by very significant odds, whereas the dense parent was not recovered in a single progeny and the lax parent in very few. One or more minor factors seemed to be involved in the inheritance of spike density. One-factor differences were suggested for glume color and awning and a two-factor difference for kernel color.

Studies on the failure of hybrid germ cells to function in wheat species crosses, W. P. Thompson and J. M. Armstrong (*Canad. Jour. Research*, *6* (*1932*), *No. 4, pp. 362–373, figs. 3*).—Determination of chromosome numbers in numerous male gametophytes of F_1 between 21- and 14-chromosome species of

wheat at the University of Saskatchewan showed that pollen grains with various chromosome numbers from 14 to 21 actually are formed and in about the theoretical proportions. The lack of plants in later generations which should result from functioning of pollen grains with intermediate numbers therefore appeared not due to the failure of such grains to be formed because of a lack of random segregation at the second reduction division.

Grains with intermediate numbers are retarded in their nuclear development, so that counts on stamens in which division is most active give a smaller proportion of grains with intermediate numbers and a higher proportion with parental numbers than expected. Retardation in nuclear development is correlated with a deficiency in cytoplasmic contents, 10 to 15 per cent of the grains showing little or no cytoplasm, and another 15 or 20 per cent showing some degree of reduction in cytoplasm. All grains with reduced cytoplasm and some of those with normal contents are so retarded in nuclear development that they can not function when the normal ones are mature and the stamen dehisces. Unfavorable chromosome conditions in grains with intermediate numbers cause a complete abortion of some grains and retardation of nuclear development in others.

Under the best available experimental conditions only 11 or 12 per cent of F_1 pollen grains germinate, in contrast to 70 or 80 per cent for parental pollen. No grains with reduced cytoplasm germinate, and at least 50 per cent of those with apparently normal cytoplasm fail to germinate.

Correlated inheritance in a cross between Dicklow × Sevier wheat, G. Stewart (*Jour. Amer. Soc. Agron., 23 (1931), No. 11, pp. 916–928*).—Genetic studies at the Utah Experiment Station into the F_3 of a cross between Dicklow wheat with short awn tips, white glumes, and intermediate spike density, and Sevier 121, fully awned and with bronze glumes and semidense spikes, suggested single factor differences for spike density, awn color, and awning. The only important positive correlation found was for spike density and awn length.

Inheritance in a wheat cross between Ridit and a segregate of Federation × Sevier (14–85), G. Stewart (*Jour. Amer. Soc. Agron., 23 (1931), No. 12, pp. 964–976, figs. 5*).—Genetic data are presented from a Utah Experiment Station study into the F_3 of Ridit × 14–85. Ridit is a midtall, apically awned, bunt-resistant winter wheat with white chaff and red kernels, and 14–85 (Federation × Sevier) is a somewhat shorter, fully awned, susceptible spring wheat with bronze chaff and white kernels. One-factor differences were suggested for glume color, awning, and spike desity and two-factor differences for kernel color and spring v. winter growth habit. In spike density, homozygous progenies more dense than the dense parent and more lax than the lax parent were obtained.

Predicting the value of a cross from an F_2 analysis, J. B. Harrington (*Canad. Jour. Research, 6 (1932), No. 1, pp. 21–37, figs. 3*).—Results of extensive breeding work with Marquillo × Marquis, a cross made to combine the rust resistance of Marquillo with the desirable qualities of Marquis, were compared at the University of Saskatchewan with the original expectation and the expectation calculated from a study of random F_2 populations. Analysis of random F_2 populations for different important agronomic characters, including stem rust reaction, indicated that about 7 good lines could be expected from 40,000 F_2 plants, providing genetic linkage did not interfere. A further reduction in the number of selections could be predicted, since this analysis could not include baking quality. Results on the best 27 lines from the breeding project showed that baking quality was a difficult character in this cross. There also were indications that genetic linkage might be involved with factors

for rust reaction, seed appearance, and crumb color. The F_2 analysis appeared to give a reasonably accurate prediction of the doubtful values of the cross, although it had distinct limitations as to characters such as baking quality which could not be studied in F_2.

Natural crossing in wheat, oats, and barley at Saskatoon, Saskatchewan, J. B. HARRINGTON (*Sci. Agr., 12 (1932), No. 8, pp. 470–483*).—A study of several varieties of each of wheat, oats, and barley within the period 1925 to 1929 at the University of Saskatchewan revealed natural crossing in wheat to range from 0 to 2.16 per cent, averaging 0.88; hulled oats to range from 0 to 0.2 per cent, averaging 0.07; naked (Liberty) oats 0.51 to 9.82 per cent, averaging 3.68; awned barley 0 to 0.17 per cent, averaging 0.07; and hooded (White Hull-less) barley 0 to 0.37 per cent, averaging 0.16. While differences between crops and species were large, seasonal effects did not appear to be very important. The results seemed to indicate for wheat and barley a greater propensity for crossing under humid than under dry conditions.

Studies on inheritance in pigeons, IX, X (*Genetics, 16 (1931), No. 6, pp. 531–546, figs. 2; pp. 547–573, figs. 10*).—In continuing this series (E. S. R., 64, p. 726) two papers are reported.

IX. *The chocolate-brown plumage color*, D. G. Steele.—Data are given on reciprocal matings of black and brown and brown and red pigeons, in which it was found that a 2-factor hypothesis would explain the results assuming a sex-linked factor *B* for black and *b* for brown and an autosomal factor *E* for extension. It is noted that the eyes of the young dilute browns appeared like albino eyes but darkened with age. In studying the linkage of black and the intensity factor, *BibI* males were mated with *Bi–*, *bI–*, and *bi–* females. The combined results with 126 offspring showed 36.5 per cent crossing over. It is also suggested that the sex-linked genes for black and dominant red are very closely located on the chromosome.

X. *Relation of chocolate to black and dominant red*, L. E. Hawkins.—Evidence is presented from eight types of matings to indicate that black, chocolate, and dominant red form a triple allelomorphic series. The percentage of crossing over between intensity and dominant red was calculated at 47.01 per cent and between black and intensity at 49.5 per cent, indicating that black and dominant red have the same locus, and no crossing over between dominant red and chocolate occurred in 202 back-cross progeny. Chocolate and black flecking was observed only in heterozygous dominant red males, and the flecking occurred after castration, indicating that it is not a secondary sexual characteristic due to the testicular hormone. A microscopic study of the pigment granules in the dominant red, black, and chocolate birds showed that the size, shape, and arrangement of the granules were similar. Some discussion is given of the similarity in the biochemical relations of pigments in birds and mammals.

A study of the methods of breeding the best Shorthorns in the United States during the period 1920—1928, E. E. BROCKELBANK and L. M. WINTERS (*Jour. Heredity, 22 (1931), No. 8, pp. 245–249, fig. 1*).—A study of the inbreeding in the pedigrees of Shorthorn cattle winning the first or second prizes at the International Livestock Exposition from 1924 to 1928 indicated that the production of show winners is based largely on phenotypic selection rather than on an attempt to concentrate, by inbreeding, the outstanding qualities of the winners. There was a greater tendency for prize winners to produce prize winners than was observed in random bred stock.

Linkage in size inheritance, C. V. GREEN (*Amer. Nat., 65 (1931), No. 701, pp. 502–511, figs. 4*).—In a study of the linkage of size factors for weight, length, skull and other bone measurements, etc., with color characters in mice, the F_1 hybrids from the *Mus bactrianus* and *M. musculus* cross (E. S. R., 65,

p. 328) were back-crossed with the *M. musculus* strain, which was homozygous for the recessive characters nonagouti, brown, and dilution. The *M. bactrianus* strain was homozygous for the dominant allelomorphs of these characters. The average measurements of each of the six color groups are tabulated for the two sexes. The brown mice of both sexes were significantly heavier than the blacks at 181 days, but this difference did not prevail at the younger ages. There were no significant differences in skull length or cranial capacity, but the browns surpassed the blacks in body length and length of humerus, femur, and tibia. It also appeared that other factors for body length and tail length were linked with the dilution gene.

Differences between conjoined twins, H. H. NEWMAN (*Jour. Heredity, 22 (1931), No. 7, pp. 200–215, figs. 9*).—The characteristics of several pairs of conjoined twins are described with special reference to the existence of greater differences between the conjoined twins than usually occurs between separated monozygotic twins. Although there seems to be some overlapping between monozygotic and dizygotic twins, the author believes they can be separated by careful study.

Sextuplet lambs, J. F. WILSON and D. W. GREGORY (*Jour. Heredity, 22 (1931), No. 7, pp. 229, 230, fig. 1*).—An account is given of the birth of six living lambs by a purebred Romney ewe. One lamb, however, died 24 hours after birth.

Does X-ray treatment produce a genetic aftereffect? N. W. TIMOFEEFF-RESSOVSKY (*Jour. Heredity, 22 (1931), No. 7, pp. 221–223, figs. 2*).—The existence of after-effects of X-rays upon the rate of mutation in Drosophila was considered doubtful as a result of tests in which one lethal was produced in 793 untreated control matings and two lethals occurred from 756 crossings tested to bring out after-effects of X-ray treatment.

Biochemical studies of human semen.—III, Factors affecting migration of sperm through the cervix, E. G. MILLER, JR., and R. KURZROK (*Soc. Expt. Biol. and Med. Proc., 28 (1931), No. 8, pp. 857–859*).—In continuing this series (E. S. R., 65, p. 27), a description is given of the penetration of the spermatozoa through the viscid mucus in the cervix uteri and the part probably played by electrochemical processes in enabling the spermatozoa to pass through this viscid material.

The vaginal smear of the ewe, H. H. COLE and R. F. MILLER (*Soc. Expt. Biol. and Med. Proc., 28 (1931), No. 8, pp. 841–843*).—From a study of the cyclic changes in the vaginal smear in the ewe, at the California Experiment Station, the ewes studied were found to have a breeding period of about six months with cycles recurring at about 17-day intervals during this period. Microscopic changes in the smear were not as evident as in some other animals, and in the early and late portions of the long anoestrous period changes comparable to those occurring during the breeding season were noted.

Effect of oestrin and lutein combinations on uterus of the mouse, D. I. MACHT and A. E. STICKELS (*Soc. Expt. Biol. and Med. Proc., 28 (1931), No. 8, pp. 801–805*).—In several experiments with mice the tendency of oestrin to cause hypertrophy in the uterus was counteracted by injections of an aqueous solution of corpus luteum extract.

The gonad stimulating and the luteinizing hormones of the anterior lobe of the hypophysis, H. L. FEVOLD, F. L. HISAW, and S. L. LEONARD (*Amer. Jour. Physiol., 97 (1931), No. 2, pp. 291–301, figs. 5*).—The authors report the separation from an aqueous pyridine extract of the dried anterior lobe of the hypophysis of a fraction which induced ovulation in the immature ovary, and another fraction which, with the above, caused luteinization in the ovary. The results with several rats injected with each extract singly and in combination are tabulated.

Specificity of reactions produced by injection of urine from pregnant cows into immature female guinea pigs, G. N. PAPANICOLAOU (*Soc. Expt. Biol. and Med. Proc., 28 (1931), No. 8, pp. 807–810*).—Studies on the injection of urine from pregnant cows into immature female guinea pigs indicated that the active substance had a general effect upon the vascular system, causing secondary effects in various organs including the ovaries.

Ineffectiveness of prolan in hypophysectomized animals, F. L. REICHERT, R. I. PENCHARZ, M. E. SIMPSON, K. MEYER, and H. M. EVANS (*Soc. Expt. Biol. and Med. Proc., 28 (1931), No. 8, pp. 843, 844*).—In experiments with three young bitches and one rat, all of which were hypophysectomized, it was found impossible to reestablish the normal development and function of the reproductive system by the administration of prolan, the hormone found in the urine of pregnant women.

Relation of prolan to the anterior hypophyseal hormones, H. M. EVANS, K. MEYER, and M. E. SIMPSON (*Soc. Expt. Biol. and Med. Proc., 28 (1931), No. 8, pp. 845–847*).—Evidence is presented to indicate that prolan, the hormone in pregnancy urine, produces its effect by acting on a substance in the hypophysis. In an experiment cited the average weight of the ovaries in young rats was increased after 100 hours to 62 mg. and they contained from 6 to 12 corpora lutea and a few large follicles when 54.2 mg of prolan was administered. When 65 mg of the hypophysis hormone was administered, the average weight of the ovaries was 21.3 mg and they contained from 1 to 6 small corpora lutea. When equal amounts of both hormones were given, the average weight of the ovaries was 156.3 mg, and they contained innumerable corpora lutea and many large follicles. The increased weight and development of the ovaries when both hormones were administered indicates that the action of the prolan on the reproductive system is brought about by its action on the hypophysis.

FIELD CROPS

[Field crops work in Louisiana, 1929–1931], A. H. MEYER, H. B. BROWN, H. STONEBERG, J. P. GRAY, J. R. COTTON, J. C. MILLER, W. D. KIMBROUGH, E. C. TIMS, C. W. EDGERTON, [T. C.] RYKER, D. E. ELLIS, W. G. TAGGART, E. C. SIMON, C. B. GOUAUX, A. K. SMITH, [A. M.] O'NEAL, and S. J. BREAUX, JR. (*Louisiana Stas. [Bien.] Rpt. 1930–31, pp. 16, 17, 24–38, 98–100, 102, 103, 108, 109, 120–133, 138–140, figs. 3*).—Experiments with field crops (E. S. R., 63, p. 330) reported on in these pages comprised variety trials with cotton, corn, oats, grain sorghum, sorgo, sugarcane (E. S. R., 66, p. 32), soybeans, and miscellaneous grasses and legumes; breeding work with cotton, corn, sugar beets, and soybeans; study of the mutations of the Porto Rico sweetpotato; cultural (including planting tests) with cotton, corn, potatoes, and soybeans; fertilizer trials with corn, sugarcane, potatoes, sweetpotatoes, and alfalfa; tests of legumes as green manure for potatoes; soil fertility studies in the sugarcane district (E. S. R., 65, p. 718); intercropping tests of corn and soybeans; seed treatments with cotton, corn, and potatoes; and studies of the root development of sugarcane (E. S. R., 65, p. 828) and cotton, of the maturity of sugarcane, and the relation of soil reaction to soil type and to yield and sucrose content of sugarcane. Several of the investigations were conducted in cooperation with the U. S. Department of Agriculture.

[Field crops experiments in Rhode Island] (*Rhode Island Sta. Rpt. [1931], pp. 44, 45, 46, 47*).—Brief reports are given on seed source trials with potatoes, effects of paper mulch on vegetables, fertilizer needs of lawns and bentgrass, varieties of grasses for golf putting greens, and on the seed production of various bentgrasses.

[Cooperative experiments with field crops in Ontario] (*Ontario Dept. Agr., Agr. and Expt. Union Ann. Rpt., 52 (1931), pp. 10–91, fig. 1; 53 [1932], pp. 7–38*).—Papers relating to experiments on various phases of crop production and utilization presented at the fifty-second and fifty-third annual meetings of the Ontario Agricultural and Experimental Union at Guelph in January, 1931 and 1932, included the following for 1931: Co-operative Experiments in Field Husbandry in 1930 and for Several Years, by W. J. Squirrell (pp. 10–35); Results of Co-operative Experiments with Fertilizers, by R. Harcourt (pp. 36, 37); The Influence of Fertilizers on the Yield and Composition of Pasture Grass, by N. J. Thomas (pp. 37–41); Results of 1930 Demonstration Experiments, by H. G. Bell (pp. 41–45); A Soil Improvement Program, by G. Skinner (pp. 45–60); Reducing Costs of Production by Means of Machinery, by L. G. Heimpel (pp. 61–76); The Utilization of Home Grown Feeds, by J. C. Steckley (pp. 76–84); Report of Committee on Weed Eradication, by J. E. Howitt (pp. 84–87); and Some Problems in Corn Borer Control, by L. Caesar (pp. 88–91). For 1932, the papers included Co-operative Experiments in Field Husbandry in 1931 and for the Average of Several Years, by W. J. Squirrell (pp. 7–26); Results of Co-operative Experiments with Fertilizers, by R. Harcourt and H. G. Bell (pp. 26–35); and Some Results of Experiments with Chemical Weed Killers, by J. E. Howitt and W. M. Gammon (pp. 35–38).

Soil and field-crop management for Cayuga County, New York, A. F. Gustafson (*New York Cornell Sta. Bul. 538 (1932), pp. 1–3, 4–88, 109–114, pl. 1, figs. 33*).—Based on the soil survey of Cayuga County (E. S. R., 56, p. 316), these pages describe the soils and the soil areas and their agriculture, and make suggestions in regard to the maintenance of soil fertility and the management and fertilization of crop rotations in the county. Practical information is given on the soil, fertility, and cultural needs of different field crops in the area. The climate, topography, and transportation facilities of the county are discussed briefly.

Tillage methods for high altitude dry farming, W. A. Moss (*Idaho Sta. Bul. 186 (1931), pp. 11, fig. 1*).—Practices found to increase wheat yields in cultural experiments carried on for several years at the High Altitude Substation at Felt, Idaho, included good summer fallow, harrowing and also June plowing with good fallow, and plowing instead of disking. Yields were increased by disking before spring plowing but not by disking before fall plowing. Fall plowing for summer fallow returned higher wheat yields than did spring plowing.

Crop rotations and soil management for eastern Canada, E. S. Hopkins and W. C. Hopper (*Canada Dept. Agr. Bul. 136, n. ser. (1930), pp. 63, figs. 19*).—Practical information is given on the advantages of crop rotations, their duration and suitability for different types of farming, and methods used in producing crops in rotations, and on the management of clay, sandy, peat, and muck soils, and hillsides and rolling land.

The Russian experiments in plant breeding, C. C. Hurst (*Empire Cotton Growing Rev., 9 (1932), No. 1, pp. 4–20, figs. 3*).—A review is given of current crop improvement activities in the Union of Socialistic Soviet Republics concerned with cotton, fiber plants, wheat-rye hybrids, and general plant breeding.

Investigations on the water requirements of different grasses [trans. title], R. Schwarz (*Wiss. Arch. Landw., Abt. A, Arch. Pflanzenbau, 8 (1932), No. 2, pp. 276–334, figs. 5; Eng. abs., pp. 316, 317*).—Grasses were grown in lysimeters and their water requirements determined during the years 1925–1928. The respective average yields of hay and number of kilograms of water required to produce 1 kg of hay were for reed canary grass 10,966 kg per hectare (9,781 lbs. per acre), 535 kg; perennial ryegrass 9,700 kg, 474; orchard grass 10,960 kg,

501; meadow fescue 9,890 kg, 474; timothy 10,330 kg, 489; meadow foxtail 9,270 kg, 553; tall oatgrass 12,340 kg, 485; and bluegrass 9,330 kg, 523. The dry matter percentage ranged from 89.2 in orchard grass and meadow foxtail to 90.2 in tall oatgrass.

Increasing yields were observed to result in a higher consumption of water and a decrease in the water needed to produce 1 kg of hay. Decreasing yields resulting from premature cutting also caused a lessened consumption of water per kilogram of hay. The lowest consumption of water for 1 kg of hay occurred in the first and second cuttings and depended principally on the date of cutting. The water required for 1 kg of hay was always highest in the third cutting. The highest yields occurred mostly in the first period of growth, while the highest daily consumption of water was in the second period when summer atmospheric conditions promoted evaporation. The consumption of water seemed to vary as the temperature, sunshine, percipitation, wind, and air moisture promoted or checked the evaporation. The date of cutting the grasses also was an important factor in the economical use of water. Early cutting results in preserving water.

Ecology and relative importance of the dominants of tall-grass prairie, J. E. WEAVER and T. J. FITZPATRICK (*Bot. Gaz.*, *93* (*1932*), *No. 2*, *pp. 113–150*, *figs. 30*).—An intensive study of the vegetation of the prairie reported on from the University of Nebraska deals with the life histories, distribution, and relative importance of the dominant grasses in a central area of the tall grass prairie.

Differences between barnyard grasses and Japanese millet, E. N. BRESSMAN and E. S. FRY (*Jour. Amer. Soc. Agron.*, *24* (*1932*), *No. 2*, *pp. 123–128*, *figs. 3*).—The characteristics distinguishing the seed and plants of barnyard grass (*Echinochloa crusgalli*) and Japanese millet (*E. frumentacea*) are described from a study made at the Oregon Experiment Station.

The fertility factor in turf production, T. D. HALL and D. MOSES (*So. African Jour. Sci.*, *28* (*1931*), *pp. 180–201*, *pl. 1*, *figs. 4*).—Combinations of fertilizers were applied to grass plats at four centers in South Africa in 1929 and 1930, and the effects on yield and botanical composition were studied. At localities receiving summer rainfall, the addition of phosphate to nitrogen greatly increased yields. Plats receiving weed killer (iron sulfate plus ammonium sulfate) with various combinations usually yielded less than with similar treatments without weed killer. The higher quantities of nitrogen with potassium, and with phosphate, potassium, and lime consistently gave the highest yields. Sodium nitrate with phosphate and potassium produced fairly good yields at all centers but did not result in the best quality of turf.

The closest cover was produced on limed and unlimed plats treated with weed killer, ammonium sulfate, phosphate, and potassium. Complete fertilizer with and without lime consistently gave a dense sward. The lower yields obtained from complete fertilizer with weed killer compared with fertilizer alone, together with the good turf produced, was considered to be a distinct advantage to the greens keeper.

The protein content was increased very definitely by nitrogen alone or various combinations with phosphate, potassium, and lime; a still greater increase followed double quantities of nitrogen, whereas nitrogen with weed killer appeared to suppress protein formation. Phosphate had no noticeable effect on the phosphorus content, but the potassium and lime were reflected in the analyses. The pH value of the soil was lowered by ammonium phosphate and sulfate and iron sulfate, was not affected by superphosphate, and was increased by sodium nitrate.

The effects of fertilization on the chemical composition of vegetation in pastures, B. A. Brown (*Jour. Amer. Soc. Agron., 24 (1932), No. 2, pp. 129–145*).—Chemical analyses of the herbage collected in 1929 and 1930 from several variously fertilized permanent pasture plats in the grazing experiment (E. S. R., 61, p. 431; 65, p. 727) at the Connecticut Storrs Experiment Station are reported on.

The influence of fertilizers on the total ash content was not very evident, the quantity of ash tending to increase as the season advanced. All fertilizers increased the nitrogen content of the pasturage, which in general was influenced as much by white clover as by fertilizer nitrogen. No nitrate and little ammoniacal nitrogen was found in the air-dry samples taken May 18, 1929, one month after fertilization. The fiber content usually was between 20 and 25 per cent of the dry matter and tended to increase as the season advanced. Unfertilized pasture produced herbage with the greatest percentage of fiber. The nitrogen-free extract varied inversely with the nitrogen, ranging from 36 to 50 per cent of the dry matter. The fat seemed to vary conversely with the nitrogen and inversely with the nitrogen-free extract and fiber, although the effects of fertilization were not striking. The proportion of phosphorus in the pasturage was increased markedly by superphosphate, averaging for both years about 60 per cent. The further addition of lime or potassium evidently was responsible for further small increases in the phosphorus content of the vegetation. In 11 of 12 comparisons, addition of potassium to the phosphorus or phosphorus and lime treatments increased the quantity of potassium in the pasturage.

The calcium in the forage was influenced by the prevalence of clover, which was most abundant on the phosphorus-lime or phosphorus, lime, and potassium plats. Omission of superphosphate resulted in very low calcium contents in Kentucky bluegrass and sweet vernal grasses on the lime-potassium plat, and these grasses and also clover from the nitrogen, phosphorus, and potassium pasture had low contents of calcium, whereas superphosphate alone greatly increased the calcium in these species. Omission of superphosphate, and fertilization with phosphorus and lime and with phosphorus, lime, and potassium resulted in pasture with high calcium-phosphorus ratios.

On the same pastures the percentages of silicon, iron, and aluminum varied widely in the two seasons, probably because of adhering soil. Magnesium varied consistently with the calcium, and manganese was uniformly 100 per cent higher in the herbage from unlimed plats. The chlorine content was lowest on the unfertilized pastures and was higher on the phosphorus-potassium and the phosphorus, lime, and potassium than on the phosphorus and phosphorus-lime pastures. The total sulfur was higher in fertilized pasturage

Pastures: Their improvement and management, D. B. Johnstone-Wallace (*New York Cornell Sta. Bul. 538 (1932), pp. 3, 89–108, figs. 11*).—The classes of pasture in Cayuga County are described, and methods are suggested for pasture management and improvement without plowing and by plowing and reseeding.

Improvement of rough and hill grazings, I–III, R. G. Stapledon (*Jour. Min. Agr. [Gt. Brit.], 38 (1932), Nos. 11, pp. 1109–1113, 12, pp. 1215–1222; 39 (1932), No. 1, pp. 36–46*).—Studies of the merits of different practices on the improvement of different types of rough and hill pasture lands, together with experience, led to recommendations in regard to selection of areas and the program for improvement, seeding, cultivation, fertilizers, and the management of grazing.

Improvement of pastures, J. A. Hanley et al. (*Jour. Min. Agr. [Gt. Brit.], 39 (1932), No. 1, pp. 24–36*).—Pasture investigations carried on at 14 centers in

Great Britain during the seasons 1928–1931 showed a wide range in the total yields of dry matter per acre obtained from untreated plats at different centers in any one season. The shape of the yield curves throughout the season also differed for the different centers. Variations also noticeable in the yield of dry matter at each center from season to season were reflected to a certain extent by the rainfall during each season. Application of fertilizers did not markedly influence the shape of the yield curves either in 1929 or 1930, yet there was a very marked beneficial effect on the total yield of dry matter per acre throughout the season. Average increases for all centers were 1,526 lbs. per acre in 1929, 1,494 in 1930, and 1,103 lbs. in 1931, and were accompanied by improvement in quality as measured by the increased protein content of the dry matter in 1929 and increases in the protein, lime, and phosphorus in 1930 and 1931.

Recent advances in pasture management, O. McConkey (*[Gt. Brit.] Empire Marketing Bd. [Pub.] 43 (1931), pp. 43*).—From a study in Great Britain and northern Europe the author points out recent discoveries and portrays the current status of grassland research.

Relation of strains of nodule bacteria and fertilizer treatments to nodulation and growth of alfalfa, S. C. Vandecaveye (*Jour. Amer. Soc. Agron., 24 (1932), No. 2, pp. 91–103*).—Alfalfa seed inoculated according to directions and planted without a nurse crop at the customary seeding rate resulted in satisfactory inoculation of the crop with most of the strains of nodule bacteria tested in studies by the Washington Experiment Station on several soil types in western Washington. Good stands were secured, yet the crop on all plats, even when limed and fertilized, did not grow satisfactorily toward the end of the first and in the two subsequent growing seasons. No significant difference in vigor and growth of the alfalfa was observed on any of the plats as a result of strain specificity of the bacteria. Since soil inoculation with nodule bacteria, soil drainage and physical condition, and soil reaction did not prove to be limiting factors in the growth of alfalfa, it appeared that the available mineral plant food in these soils probably was deficient for the successful growth of the crop and was not restored by one generous application of commercial fertilizers. Repeated application of manure or green manure in addition to liberal quantities of commercial fertilizers is suggested before seeding these soils to alfalfa.

The quality of alfalfa seed as affected by color and plumpness, G. Stewart and J. W. Carlson (*Jour. Amer. Soc. Agron., 24 (1932), No. 2, pp. 146–155*).—Further germination studies at the Utah Experiment Station with alfalfa seed (E. S. R., 55, p. 735; 56, p. 433), partly discussed from another source (E. S. R., 65, p. 432), demonstrated that bright, plump seeds germinated 67.2 per cent in the laboratory and 48.8 per cent in the field compared with 55.1 and 40.9 per cent, respectively, for the unsorted bulk check. Observations on the effect of clipping the first growth at various stages and of differences in irrigation and cultivation practices revealed significant increases in discolored seeds only in those plants on which the seed crop was allowed to start late. This was accomplished by growing a hay crop before the growth from which seed was to be taken was allowed to start.

Seed setting in lucerne, R. E. [P.] Dwyer (*Agr. Gaz. N. S. Wales, 42 (1931), No. 9, pp. 703–708*).—Preliminary observations at the Bathurst Experiment Farm on factors controlling seed setting in alfalfa, i. e., climate, environment, insects, and artificial tripping, are discussed briefly, with comments on producing districts in New South Wales and on work of others.

Further observations on pollination and seed setting in lucerne, R. E. P. Dwyer and S. L. Allman (*Agr. Gaz. N. S. Wales, 43 (1932), No. 2, pp. 141–

146).—In continued studies to determine the agencies causing self- or cross-pollination, it was noted that the main tension in the flower is concentrated in the curved staminal column. There is a well developed vascular system present in the wings of the flower petals. In the field, application of heat was found to cause automatic tripping, which was also achieved by dipping the flowers in alcohol. Flowers in varying humidity conditions in the laboratory tripped readily at from 100 to 108° F. Pollen scattered for a considerable distance following mechanical tripping. It was observed frequently on the standards of untripped flowers and was found to germinate readily. Wind appeared to be likely to increase the radius of spread of pollen, whereas rain was deemed unimportant, especially since excessive moisture inhibits the germination of pollen. Delayed tripping with exposure of anthers was noted both in the open and under cages.

Field beans in Canada, W. G. McGregor (*Canada Dept. Agr. Pamphlet 141, n. ser.* (*1931*), *pp. 8, fig. 1*).—The status of the crop in Canada is reviewed, with remarks on cultural methods and field practices and on varieties found best in tests in the several Provinces and at Ottawa.

A comparison of hand and wind pollination in making F_1 ***crosses between inbred lines of corn,*** I. J. Johnson and H. K. Hayes (*Jour. Amer. Soc. Agron., 24* (*1932*), *No. 2, pp. 85–90*).—An extensive series of single crosses was made in 1930 at the Minnesota Experiment Station to obtain a seed increase and to determine the best methods for making first crosses to be used in more extensive production of double crosses (E. S. R., 65, p. 131). The results favored the making of F_1 crosses by the use of isolated plats in which the pistillate parent is detasseled. Cost studies with four crosses gave a weighted average cost per pound of 93 cts. for hand pollination and 27 cts. for wind pollination. An increase in yield of hybrid seed gained by the use of supplementary pollen cost more per pound of increase ($1.22) than the original cost by wind pollination methods. The production of F_1 hybrids of Golden Bantam sweet corn by wind pollination (12 to 14 cts.) cost less than for field corn, whereas single crosses from pop corn selfed lines cost more (52 cts.) to produce than for sweet or field corn, due primarily to unfavorable location of the crossing plat.

The effect of some meteorological conditions on the growth of Punjab-American cotton, T. Trought (*India Dept. Agr. Mem., Bot. Ser., 17* (*1931*), *No. 6, pp. 137–154, figs. 6*).—The climate of the Punjab during the cotton-growing season is compared with that of several other cotton-growing countries. As to the daily increase in height of Punjab-American cotton 4F, an increase in the rate of elongation was observed to take place after rain and irrigation and a temporary decrease following dust storms. The evaporation in cotton fields decreased as the crop grew and became fairly constant. A connection was apparent between elongation and maximum soil temperature at 30 cm depth in irrigated fallow. The effects of maximum and minimum air temperatures on stem elongation were slight under irrigated conditions.

Annual report of the Indian Central Cotton Committee, Bombay, for the year ending August 31st, 1931, J. H. Ritchie et al. (*Indian Cent. Cotton Com., Bombay, Ann. Rpt. 1931, pp.* [2]+*119*).—The progress of technological research, marketing, and administrative activities of the organization in different localities in India is reported on for the year ended August 31, 1931. The work of the Technological Laboratory with cotton in 1930–31 is reviewed (pp. 41–67) by N. Ahmad, and the report of the Institute of Plant Industry, Indore, for the year ended June 30, 1931, is appended (pp. 70–82).

Supplement to flax facts (*Minn. Univ. Agr. Ext. Pamphlet 22* [*1931*], *pp. 4; Mont. Agr. Col. Ext. Bul. 112* [*1931*], *pp. 4; N. Dak. Agr. Col. Ext. Circ. 87*

[1931], pp. 4; S. Dak. Agr. Col. Ext. Circ. 306 [1931], pp. 4).—This supplement to an earlier publication (E. S. R., 63, p. 440) gives the outlook for flaxseed in 1931.

Korean lespedeza, A. E. ALDOUS (*Kansas Sta. Circ. 163 (1932), pp. 7*).—Information is presented on the characteristics, adaptation, and cultural needs of Korean lespedeza in Kansas, its use for pasture and hay and for checking erosion, and on seed-production practices. Korean is said to be superior to Kobe and Tennessee 76 lespedeza for Kansas conditions.

Lespedezas in southeastern Ohio, S. C. HARTMAN (*Ohio Sta. Bimo. Bul. 155 (1932), pp. 59–65, fig. 1*).—Further studies with lespedeza, or Japan clover (E. S. R. 59, p. 131), indicated the limitations of the legume for pastures in southeastern Ohio. Japanese lespedeza may be slightly superior to Korean lespedeza. The Japanese variety was considered to be valuable for the permanent pastures in the region. Lespedeza did not seem to compare in Ohio with soybeans or Sudan grass for hay, and was generally lower in protein than the more common legumes of the State. Seed selection is important as to origin, germination, and weed content. Early spring seeding without special preparation at the rate of 4 lbs. per acre on pasture was indicated. The lespedeza responded to light applications of fertilizer but not to lime.

A study of anthesis in cultivated oats, A. R. CALLAGHAN (*Agr. Gaz. N. S. Wales, 42 (1931), No. 4, pp. 311–321, fig. 1*).—The process and sequence of flowering in cultivated oats under Australian conditions are traced, with observations on the influence of time of day, temperature, and humidity.

The pigeon pea (Cajanus indicus): Its improvement, culture, and utilization in Hawaii, F. G. KRAUSS (*Hawaii Sta. Bul. 64 (1932), pp. 46, pl. 1, figs. 18*).—This is a revision of and supersedes Bulletin 46 (E. S. R., 46, p. 440).

The Late Cobbler, a new variety of potato, J. BUSHNELL (*Ohio Sta. Bimo. Bul. 155 (1932), pp. 68–70, fig. 1*).—The Late Cobbler, a new potato originated by F. S. Hollenbeck as a selection from Irish Cobbler, resembles the latter in type of vine and type of tuber but matures about two weeks later. Comparative tests with the two Cobblers and Russet Rural are noted briefly.

[Rice investigations in Louisiana, 1930 and 1931], J. M. JENKINS (*Louisiana Stas., Rice Sta. Bien. Rpt. 1930–31, pp. 4–10*).—Variety trials, rotation experiments, seeding tests, and the use of artificial manure as a fertilizer, all with rice, and observations on the weather and its effects upon rice yields, were made during 1930 and 1931 at the Rice Experiment Station, Crowley, as heretofore (E. S. R., 63, p. 133), in cooperation with the U. S. Department of Agriculture.

Classification and study of characters of the cultivated rices in the United Provinces, R. L. SETHI and B. P. SAXENA (*India Dept. Agr. Mem., Bot. Ser., 18 (1930), No. 6, pp. 149–209, pls. 6*).—Detailed descriptions of the vegetative and reproductive characters of rice (*Oryza sativa*) are presented, together with a classification following Kikkawa's system (E. S. R., 29, p. 535), in which 135 types of rice collected in the United Provinces and isolated as pure strains are described and grouped according to the characters of their grain.

The storage of sugar-beet on the farm, W. M. DAVIES and T. O. WILSON (*Jour. Min. Agr. [Gt. Brit.], 38 (1931), No. 8, pp. 806–814, figs. 2*).—Storage studies with sugar beets were made during three winters at the Harper Adams Agricultural College using clamps similar in dimensions—7.5 ft. at the base and 5.5-ft. sides—to those employed by Clarke et al. (E. S. R., 65, p. 225). Under the best conditions of carefully retopped beets, some loss was found to take place after January 1. With carelessly topped beets the change occurred much earlier, about November 30, and it resulted finally in greater loss than with retopped beets. No considerable changes in total weight of the beets

appeared to take place during clamping, at least not until February 15, by which time all beets would normally be delivered. A possible relationship between a low temperature of the beets in the clamp and the formation of reducing sugars is suggested.

Pollen shedding in cane, A. E. S. McIntosh (*Trop. Agr.* [*Trinidad*], *7* (*1930*), *No. 11, pp. 296–299, figs. 3*).—In the Barbados sugarcane varieties studied, varietal differences were observed in the time, duration, and quantity of pollen shedding. In general shedding was mainly confined to comparatively short periods, which indicated shedding between 6 and 8.30 a. m. Practical applications of the observations in genetic studies with sugarcane are pointed out.

Experiments in the harvesting of burned cane.—III, P. O. J. 213 cane, H. H. Dodds and P. Fowlie (*So. African Sugar Jour.*, *14* (*1930*), *No. 6, pp. 407–411*).—In further experiments (E. S. R., 62, p. 133), similar relative differences were found in the keeping qualities of burned v. unburned P. O. J. 213 sugarcane as with Uba. In unburned P. O. J. 213 cane the sucrose content decreased from the second day after harvest about 2.5 times as fast as with Uba cane. P. O. J. 213 burned before harvest showed a rise in sucrose more marked than in Uba and maintained over the first week, after which it fell at the same rate as unburned cane. In purity the unburned P. O. J. 213 deteriorated steadily from the start, about half as fast again as with Uba, while the purity of the burned harvested cane remained constant for about a week before deterioration began. Unburned P. O. J. 213 even more than Uba cane must be taken to the mill as soon as possible after harvest, while burned cane can remain for about a week during which little or no deterioration ensues.

Sowing sweet clover in winter wheat, C. J. Willard, L. E. Thatcher, and J. S. Cutler (*Ohio Sta. Bimo. Bul. 155* (*1932*), *pp. 55–59*).—The results of seeding tests with sweetclover in winter wheat at the station, Columbus, and the Trumbull County Experiment Farm from 1928 to 1930 are summarized, with tentative recommendations. Unhulled and dehulled clover seed gave as good stands and yields as scarified seed on winter wheat in enough comparisons to justify the recommendation that sowing unscarified seed in the winter or very early spring may be tried when it is difficult to secure a stand with scarified seed. However, unscarified seed should not be used after freezing weather is past. Scarified seed should be sown as early as the danger to the seedlings from freezes is past. Unhulled seed should be bought and sown by the pound rather than by bulk measure. From general experience it seemed probable that a combination seeding, planting unscarified seed in late winter and following with scarified seed as early in the spring as possible after heavy freezing weather is past, would result over a period in a larger percentage of satisfactory stands than either kind of seed alone.

Contribution to the morphological study of wheat.—Study of several secondary characters of the spike [trans. title], E. Miège (*Ann. Dir. Gén. Agr., Com. et Colon.* [*Morocco*], *1* (*1930*), *pp. 221, figs. 30*).—An extensive discourse on the agricultural and classification value and various relationships of such secondary characters of the wheat spike as glumes, flowering glumes, pubescence, basal and terminal spikelets, first internodes, rachis, and awns and their dentition is presented from detailed studies involving nearly 1,000 native and exotic cultivated varieties pertaining to 11 species of Triticum.

Twenty years of testing varieties and strains of winter wheat at the Kansas Agricultural Experiment Station, S. C. Salmon and H. H. Laude (*Kansas Sta. Tech. Bul. 30* (*1932*), *pp. 73, figs. 15*).—Comparative tests made with winter wheat varieties (E. S. R., 64, p. 826) during various periods since

1911 at the station and substations in cooperation with farmers in different sections of Kansas and with the U. S. Department of Agriculture are reviewed, and the bearing of the general results on crop improvement work is pointed out. Data from station tests of hard winter wheat are supplemented by discussion of the yields of Turkey, Blackhull, and Kanred in outlying experiments and their regional adaptation and seasonal variation in yields. Likewise yields of soft wheat varieties in station and outlying tests are considered, and Fulcaster, the leading soft wheat variety, is compared with Harvest Queen, Currell, and Kawvale, and Michigan Wonder with Harvest Queen. The milling and baking qualities of outstanding varieties (E. S. R., 64, p. 835) and general information on wheat production in Kansas (E. S. R., 62, p. 634) have been noted earlier.

Hard wheats have been found more productive than soft wheats in all of Kansas except the eastern part. There were indications that the resistance of hard winter wheats to drought and winterkilling is the principal factor making them more satisfactory than the soft wheats for the hard winter wheat belt.

Yield appeared to be related definitely with leaf rust (*Puccinia triticina*) and leaf blotch (*Septoria tritici*). Usually a high yield was associated with a low disease index and vice versa. These diseases seem to increase in importance as the rainfall increases, and consequently they probably are more important in eastern Kansas.

The common opinion that marked differences exist in tendencies to lodge and that hard wheats as a group lodge more than soft wheat was supported by data also discussed elsewhere (E. S. R., 65, p. 734). Blackhull on the average lodges less than Turkey and Kanred more. Tendency to lodge appeared to be related to breaking strength of the straw. Relative lodging as well as relative yields appeared to be influenced greatly by seasonal conditions. Certain data cited indicate that a fundamental relation exists between time of maturity (or time of heading) and yield, and that for certain sections of Kansas varieties somewhat earlier than those generally grown might be desirable.

Seasonal variation is discussed as to its general relation to varietal and strain tests and to crop improvement in general. Comparative yields of Kanred and Turkey, Kanred and Blackhull, Fulcaster and Turkey, Fulcaster and Kanred, and others seemed to corroborate the view that seasonal variation is not only the most important source of variation in field tests but is of such significance that results for a few years, even up to 10 or 15, may be very misleading and inaccurate as a basis for predicting relative yields of varieties. The question is important also in the planning of experiments.

In proposing a program for wheat improvement for the future, the authors point out that in most of the plant breeding work of the past higher yields have been the primary objective. In the future more attention should be given to quality and to such characteristics as lodging, height of straw, shattering, and distribution of risks by growing varieties which mature at different times. A better understanding of the factors determining quality would also seem to be needed.

The relative milling and baking quality of western Canadian spring wheat varieties, J. G. Malloch, W. F. Geddes, and R. K. Larmour (*Canad. Jour. Research, 6 (1932), No. 4, pp. 333–361*).—A cooperative study was made of the milling and baking quality of 25 spring wheat varieties currently grown in western Canada from samples produced in adjacent plats by the Dominion experimental farms and provincial universities in Manitoba, Saskatchewan, and Alberta in 1928, 1929, and 1930. Reward, Ceres, Marquis, Pioneer, Red

Fife, Renfrew, Red Bobs 222, and Supreme were found to be entirely satisfactory, and Early Red Fife, Ruby, and Early Triumph gave fair satisfaction. Varieties which were unsatisfactory included the white wheats Quality, Axminster, and Hard Federation; varieties differing from Marquis in milling characteristics, Garnet and Kota; and varieties inferior to Marquis in baking characteristics, Garnet, Parker Selection, Brownhead, Huron, Kitchener, Preston, and Marquillo. Early Prolific, Dicklow, and Vermilion were determined to be very unsatisfactory.

Overseas tests of the milling and baking qualities of Garnet wheat, L. H. Newman (*Canada Dept. Agr. Bul. 134, n. ser. (1930), pp. 98, figs. 2*).—Milling and baking studies with Garnet wheat (E. S. R., 58, p. 34) of the 1928 crop, pure and in mixtures, by institutions and mills in Great Britain, Europe, Canada, and the United States are reported in detail and summary form.

The effect of storage at various moisture contents on baking quality of Marquis wheat, R. K. Larmour (*Canad. Jour. Research, 6 (1932), No. 2, pp. 156-161*).—After Marquis wheat was stored at 21° C. and at outside winter temperature for 1 and 4 months at the University of Saskatchewan in 5-lb. sealed containers at moisture contents ranging from 10 to 22 per cent, no evidence of improvement or deterioration of baking quality was observed, except with samples having 16, 18, 20, and 22 per cent of moisture stored at 21° for 4 months. These were lower in quality, principally because of mustiness of the wheat.

The milling and baking quality of frosted wheat of the 1928 crop, W. F. Geddes, J. G. Malloch, and R. K. Larmour (*Canad. Jour. Research, 6 (1932), No. 2, pp. 119-155, figs. 5*).—Due to limited rainfall after germination and late heavy frosts, much of the 1928 wheat crop of western Canada contained many types of frost damage and immature and green kernels. A cooperative study by the Universities of Manitoba, Alberta, and Saskatchewan on 228 samples showed that the percentage of sound kernels decreased progressively as the grade dropped, with a greater relative increase in the percentage of heavy damage in the lower grades. Test weight per bushel also decreased. Individually the various forms of damage had only a slight effect in reducing weight per bushel, heavily frosted and immature kernels having a greater influence than bran-frosted kernels. Regrading after overwinter storage showed 83.3 per cent of the samples unchanged, while 13.2 per cent were graded higher. The mean total flour yield decreased with grade. Bran frost, heavy frost, and immature kernels were correlated negatively with flour yield and were about equally important in their effects. Weights per measured bushel and the percentage of total sound kernels were considered the best single indexes of flour yield. The average baking quality as measured by loaf volume, crumb color, and texture decreased with grade, except in grade No. 4, which surpassed No. 3 Northern. Absorption increased markedly in the lower grades. The straight grade and patent flours gave the same relative results when baked by either the simple or the bromate formula.

Report of seed analyses, 1931 (*Penn. Dept. Agr. Bul. 507 (1931), pp. 98*).—The germination, purity, and weed seed content are tabulated for 1,322 samples of agricultural seed collected in Pennsylvania during 1931.

Jointed cactus and its eradication (*Farming in So. Africa, 6 (1932), No. 72, pp. 495-497, figs. 3*).—The jointed cactus (*Opuntia aurantiaca*) is described by C. R. van der Merwe as one of the worst weeds on the South African veld. Its characteristics and distribution are described, together with an account of experiments aiming at its control by chemicals.

Eradication of jointed cactus, C. R. van der Merwe (*Farming in So. Africa, 7 (1932), No. 73, pp. 21–23, figs. 3*).—The results of experiments noted above indicated that a solution of sodium arsenite (36 lbs. to 100 gal. of warm water) or arsenic pentoxide (24 lbs. to 100 gal. water), applied with a fruit spray pump to growing uninjured plants, is effective in control. Treated plants are left to dry for two or three months and then are raked up and burned. Clearing the patches near rivers or streams first and restricted grazing are important control operations. The penetration of the poison into the soil and its percentages in plants following burned cactus are indicated. The adoption of suitable precautionary measures will avoid the danger of livestock losses from the poison.

Control of Selago corymbosa (*Farming in So. Africa, 6 (1932), No. 72, pp. 511, 512, 518, figs. 4*).—Resting the grass veld and burning during the winter controlled *S. corymbosa* in experiments reported by R. A. Dyer. Natural enemies and drought were not effective, and sheep grazing encouraged rather than harmed the weed.

Methods affecting the efficiency of chlorate weed killers, H. W. Hulbert, R. S. Bristol, and L. V. Benjamin (*Idaho Sta. Bul. 189 (1931), pp. 12*).—The effectiveness of chlorates in weed control is described from the results of plat tests and of several hundred commercial applications in Idaho.

Many of the variations occurring in the kills obtained from the use of chlorates can be controlled by careful application. The use of a high pressure power sprayer with a nozzle delivering a fine penetrating spray at a definite rate per unit area appeared to be especially desirable. Repeat applications were found unnecessary, except on a few weeds, as morning-glory and whitetop, if the chemical had been applied thoroughly so that all top growth was burned down. The time of spraying chlorates on morning-glory under nonirrigated conditions was of little importance, except that later applications were apparently more effective in preventing seedling growth. Mowing the first growth of the weed and spraying second growth at maturity was very successful in commercial practice.

Solutions of high concentration or more than 1 lb. of chlorate per gallon were found more costly and of little value except for covering scanty plant growth. The rate of application depends upon the weed species and apparently is affected by moisture, soil types, and seasonal conditions. Sodium chlorate alone was found to be more effective pound for pound for weed control than when used in mixtures with deliquescent salts. Considerably less chemical is required to eradicate weeds under nonirrigated and dry farm conditions than in the irrigated sections or on subirrigated soils. The rates of application of chlorates necessary to eradicate different perennial weeds in Idaho are tabulated. The chlorate content of the chemical applied largely determines the killing ability of the herbicide. The H-ion concentration of the chlorate solution was not found to be a factor in weed eradication.

Sodium chlorate as a weed control (*Jour. Min. Agr. [Gt. Brit.], 38 (1931), No. 6, pp. 665–667*).—Tests of the efficiency of sodium chlorate in weed control on cultivated land and pasture at the Research Station of Imperial Chemical Industries indicated that application in autumn was very effective in killing all vegetation, and that cabbages could be planted safely on the land in the next May. Early spring application, however, was far less effective and subsequent planting was delayed until the following autumn. Toxic effects from March treatments persisted even after six months. Oats were most susceptible to injury and red clover the most resistant.

HORTICULTURE

Southern horticulture enterprises, E. W. Garris and G. P. Hoffman (*Chicago and London: J. B. Lippincott Co., 1931, pp. VII+551, figs. 219*).—Following the job analysis plan of presentation, careful consideration has been given to those enterprises which have shown good financial returns in the South and which offer promise to growers.

[Horticulture at the Louisiana Stations], W. D. Kimbrough and J. C. Miller (*Louisiana Stas. [Bien.] Rpt. 1930–31, pp. 94–98, 101, 103–105*).—The results are presented of cultural and fertilizer tests with asparagus, snap beans, cabbage, and cucumbers and upon breeding studies with cabbage, onions, and peppers. Fertilizer studies with oranges are briefly discussed.

[Horticulture at the Rhode Island Station] (*Rhode Island Sta. Rpt. [1931], pp. 44, 45, 46, 54, 55, 56–58*).—The results are presented of varietal tests with sweet corn, paper mulch and fertilizer trials with vegetables, forcing experiments with tomatoes and the gladiolus, fertilizer and grafting experiments with grapes, breeding studies with blackberries, and propagation tests with nuts.

[Miscellaneous investigations at Cheshunt, England] (*Expt. and Research Sta., Cheshunt, Herts, Ann. Rpt., 16 (1930), pp. 77–88, figs. 5*).—Daily records taken by O. B. Orchard and W. F. Bewley on the temperature of the soil in various parts of the greenhouse showed the soil to be perceptibly warmer in the center of the house than at either side. During the early months of the year the soil was from 2 to 3° F. warmer in an airplane-type than in a vinery-type greenhouse. Records taken on the hours of sunshine showed sunshine to be of greater importance than temperature in the production of early tomatoes. Heating the soil by electricity during the nights of the ripening period hastened the ripening of tomatoes very decidedly. Where the average soil temperature was 69.1° the yield was 28.42 tons per acre as compared with 21.35 tons from a soil at 64.6°.

As determined by W. H. Read, working with an almost air-tight metal chamber in which temperature was held constant and in which ethylene concentrations of 1 in 10,000 of air were used, individual fruits of a single variety and of the same stage of maturity showed considerable variation in the time required to attain maturity. Under favorable conditions for ripening tomatoes on the plant, nothing was gained by the ethylene treatment. Ethylene-treated tomatoes were indistinguishable in appearance from normal fruits, and there was little or no difference in flavor and texture.

Bewley and B. D. Bolas found that the exposure of young tomato plants to the light from a 500-w gas-filled lamp improved their color and general appearance. In fact these plants were about five weeks ahead in development of those grown with ordinary light.

An apparatus devised for studying the rate that air passes through soil is described by Bolas. The resistance of ordinary loose garden soil was found to be equivalent to about 5 mm of water at a 6-in. depth, while that of an old unsteamed cucumber bed showed the astonishing resistance of the equivalent of 1,200 mm of water.

Growth and development as influenced by fruit and seed formation, A. E. Murneek (*Plant Physiol., 7 (1932), No. 1, pp. 79–90, figs. 3*).—Citing the results of earlier work the author, reporting from the Missouri Experiment Station, points out that very profound physiological and chemical changes occur in all higher plants during the period of flowering and seed formation. In annual plants the seed and associated tissues draw heavily on food reserves and other materials necessary to the life of the chloroplast. The nature of

the mechanism that allows the developing embryo to draw to itself and adjoining tissues the greater part of the available food supply is unknown, but it is conjectured that it may be either a general physiological reaction or the effect of a specific enzyme or hormone.

Light and the carotinoid content of certain fruits and vegetables, L. L. W. and O. SMITH (*Plant Physiol., 6 (1931), No. 2, pp. 265–275*).—Using a new method of extraction in which pyridine was employed as the solvent, determinations were made at the University of California upon the carotenoid content of peaches, apricots, nectarines, and tomatoes developing in light and in darkness. Covered Elberta peaches developed a higher carotenoid content than did exposed fruit, whereas in the Humboldt nectarine and the Royal apricot the reverse was true. The white-fleshed Mayflower peach and the Stanwick nectarine contained such small quantities of carotenoids that no determinations were made. Bagged fruit of the Clark Albino and Ruby Gold tomatoes showed an increase in carotenoid content over exposed fruits, and greenhouse-grown Clark Albino tomatoes contained more carotenoid than did outdoor fruits. Both the outdoor and greenhouse-grown red-fleshed tomatoes had a lower carotenoid content when bagged. With one exception, bagged fruits had a higher pH value than did exposed fruits. Covered tomatoes attained a full red color without passing through the normal green stage.

Freezing of pollen: Evidence as to how freezing kills plant cells, W. H. CHANDLER (*Amer. Jour. Bot., 18 (1931), No. 10, p. 892*).—Using pollen of peach, nectarine, Himalaya-berry, and snapdragon, the author found in this study at the California Experiment Station that dry pollen can withstand many hours at −15 to −18° C., whereas pollen moistened with distilled water before or after placement in the freezing chambers was practically all killed within one-half hour. Killing was less where glycerine, concentrated sap from peach bark, or concentrated solutions of sucrose, glucose, or calcium chloride were used instead of water. Concentrated sap and glycerine were toxic, more so at 20° C. than at 0 or lower. Calcium chloride was equally as toxic at 0 and −18° as at 20°. The evidence is held to support the hypothesis that freezing kills living cells by the physical effect of ice masses.

Relation of rooting response to age of tissue at the base of greenwood cuttings, A. E. HITCHCOCK and P. W. ZIMMERMAN (*Contrib. Boyce Thompson Inst., 4 (1932), No. 1, pp. 85–98, figs. 6*).—A comparison at the Boyce Thompson Institute of four different types of softwood cuttings, (1) with a mallet of last season's wood, (2) with a heel of last season's wood, (3) with a cut made at the base of the current season's growth, and (4) with the cut made from ¼ to ¾ in. above this base, showed type 3 to be the most successful. However, rooting varied with type and with the species of plant. For example, roots grew readily from the base of the current season's growth of Dorothy Perkins rose cuttings whether a mallet of older wood was or was not present, but in the American Pillar rose root growth was practically inhibited by the mallet. The wild blueberry and the cultivated varieties Adams, Pioneer, and Rubel rooted easily from all types except mallet cuttings. Time of year was an important factor; for instance, mallet cuttings of *Cornus florida* taken in May rooted much more readily than the other three types, but with little difference after June 15.

Fertilizers for greenhouse and garden crops, A. LAURIE and J. B. EDMOND (*New York: A. T. De La Mare Co., 1929, pp. X+147, figs. 22*).—This work is designed to afford the grower a better understanding of his fertility problems and at the same time to outline a soil management and fertilizer program that is both adequate and comparatively simple. It discusses the soil, important

elements, fertilizing materials, flowering crops, pot plants, greenhouse vegetable crops, outdoor ornamental crops, and outdoor vegetables.

[Vegetable experiments at Cheshunt, England] (*Expt. and Research Sta., Cheshunt, Herts, Ann. Rpt., 16 (1930), pp. 14–29*).—Of nine sources of nitrogen applied to greenhouse tomatoes, a hoof and horn material gave the best yields. Of several methods of watering tested, underground pipes gave the best results both with respect to yield and freedom from mold. Heading as compared with no pruning reduced yields. A study of F_1 generation tomatoes showed no marked mold resistance in the seedlings, but a few plants exhibited combined disease resistance and fair yielding capacity. Resistant plants occurred in the crosses between Up-to-date and Riverside Favourite, Tuckswood, Maincrop, Many Marvel, and an unnamed seedling.

Heavy and moderately heavy soils were improved by applications of wheat straw, which apparently produced an open aerated condition and acted as a source of energy to the soil flora. The growing of a winter crop of tulips preceding tomatoes did not increase tomato yields to any appreciable extent. Applications of lime actually reduced tomato yields during the first two years of culture on new soil and in the third year had no material effect.

Favorable results in cucumber growing were secured by adding wheat straw to the soil, the soil and straw plants outyielding the manured plants. However, where decayed heather roots were used as a soil amendment the crop was reduced appreciably.

New data on the use of paper mulch in the vegetable garden, R. Magruder (*Ohio Veg. Growers' Assoc. Proc., 16 (1931), pp. 43–49, figs. 3*).—Excellent results were secured by the Ohio Experiment Station in 1930 at the Mahoning County Farm from the use of paper mulch with tomatoes. During the month of August the paper mulched plants yielded 148 per cent more ripe fruit than did the ordinary cultured plants, while over the entire season the paper mulched plats yielded 45 per cent increase. At Strongville in 1930 paper mulched parsnips, carrots, onions, lettuce, beets, and Swiss chard yielded 147, 106, 238, 227, 60, and 45 per cent more, respectively, than did cultivated plants. In 1929 tests at Marietta slightly increased early yields of cabbage, sweet corn, cucumbers, and sweet peppers followed paper mulching. Of 16 different papers tested at Wooster 8 gave good results, 1 was absolutely harmful, and several were useless because of early disintegration or shrinking.

Vegetables of the Dutch East Indies, J. J. Ochse and R. C. Bakhuizen van den Brink (*Buitenzorg: [Dutch East Indies] Dept. Agr., Indus., and Com., 1931, Eng. ed., pp. XXXVI+1006, pl. 1, figs. 462*).—Descriptions and notes on use are presented on a large number of indigenous and introduced plants serving as pot herbs or salads.

Strain and variety trials of early cabbage and tomatoes, 1930 results, R. Magruder (*Ohio Veg. Growers' Assoc. Proc., 16 (1931), pp. 66–75*).—Presented largely in tabular form, the results are given of varietal and strain tests conducted at Marietta in 1930 by the Ohio Experiment Station.

Spacing studies with asparagus, H. A. Jones (*California Sta. Bul. 525 (1932), pp. 13, figs. 2*).—Data taken over a period of seven years on Palmetto asparagus plants set out in 1924 in rows 7.5 ft. apart but spaced 12, 18, 30, and 36 in. in the row showed no significant differences in the average weight of spears for the three larger spacings, but the 12-in. group was decidedly lower in weight. In all four cases average weight per spear increased to the fifth cutting season, after which there was a decline. However, the average weight per plant increased regularly during the entire seven cuttings, with yields per plant directly correlated with spacings. No significant difference in acre

yield was observed between the 12- and 18-in. spacings, but beyond this point the larger yield per plant did not offset the loss in number of plants.

Concerning the ripened stalks, the average number per plant increased with the planting distance and gradually increased from year to year with all planting distances. As with spears, the mature stalks produced on 12-in. spaced plants averaged significantly less in weight than did those from the wider spacings, with little or no difference between the three greater distances.

Pollen-tube behavior in Brassica pekinensis with reference to self-incompatibility in fertilization, A. B. STOUT (*Amer. Jour. Bot., 18 (1931), No. 8, pp. 686–695, pl. 1, figs. 2*).—Stating that self-incompatibility is strongly developed in *B. pekinensis*, the author reports that repeated selection over seven generations failed to eliminate self-incompatibility, some fully self-incompatible plants appearing each year. The reactions of self-incompatibility in the flowers of *B. pekinensis* included (1) a low percentage of germination of pollen on the stigma, (2) the coiling of pollen tubes on the papillae, (3) feeble or limited growth of tubes through the style, (4) coiling of the ends of the tubes in the pistils, ovary, or ovules, or (5) combinations of the preceding. The coiling of pollen tubes is described as a most characteristic reaction and occurred not only on the stigmatic surface but in the stylar tissue, on the walls of the placenta, in the region of the micropyle, and within the ovule itself. In a medium made up of 100 c c of water, 2 g of agar agar, and 15 g of cane sugar, pollen tubes grew to an average length of about 250 μ, with no coiling at any stage.

Floral development in Daucus carota, H. A. BORTHWICK, M. PHILLIPS, and W. W. ROBBINS (*Amer. Jour. Bot., 18 (1931), No. 9, pp. 784–796, pl. 1, figs. 36*).—Continuing work on the carrot flower (E. S. R., 66, p. 128), the California Experiment Station reports that umbel primordia in carrot roots set out at Davis in late December were differentiated by the first of March. Sepal, petal, and stamen primordia formed nearly simultaneously, followed by carpel primordia. The anthers dehisced and the stamens fell before the stigmas became receptive. Fertilization took place after the styles had separated from one another and just before petal fall.

Correlation studies on the fruit of Cucumis melo L., G. W. SCOTT (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 333, 334*).—Computations at the California Experiment Station upon the relationship between weight, shape, and density characters in several varieties and strains of cantaloupes showed with few exceptions no significant correlation, and led to the conclusion that whatever association does exist is weak and that any desired weight, shape, and density may be combined into a single line by breeding.

Seasonal variation in sex expression of certain cucumber varieties, J. B. EDMOND (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 329–332*).—Observations made at the University of Maryland upon six varieties of cucumbers grown as a midsummer crop, as a winter crop, and as a spring crop showed marked differences in growth and flowering habits with the seasons. Plants growing during the short days of winter were weakly vegetative and tended to produce a relatively small number of staminate and a large number of pistillate blooms. Within any one period the varieties differed markedly, the greatest variation being in the number of opened staminate flowers per plant and the least in the number of undeveloped staminate flowers. In varieties exhibiting a wide ratio between staminate and pistillate blooms the two types usually occurred at separate nodes, and conversely in varieties with a narrow ratio the two types frequently developed at the same node.

Morphological and chemical studies on the globe artichoke, Cynara scolymus L., G. W. Scott (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 356–359, fig. 1*).—Briefly describing the gross structure of the globe artichoke plant and the manner of development, the author presents data on the composition of the roots and of the aerial portions of young plants. In the leaves the percentage of reducing sugar was relatively high, of invert sugar intermediate, and of inulin low, whereas in the roots the situation was reversed. In some cases the percentage of inulin in the root exceeded 40 per cent of the dry weight. Iodine tests revealed no appreciable amounts of starch, leading to the conclusion that inulin rather than starch is the form in which carbohydrates are stored in the artichoke.

Inheritance of heading characteristics in lettuce varieties, M. T. Lewis (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 347–351*).—Observations at the Pennsylvania Experiment Station on a total of 7,893 F_2 segregates from 15 original crosses involving 10 varieties led to the general conclusion that the heading habit of lettuce is a quantitative character depending upon multiple factors for its expression. Intermediate forms did not always appear in the F_1 population, and a wide range of types was observed in the F_2. F_3 types superior to existing commercial lettuces were rarely recovered in crosses involving varieties of the crisp-heading group, but were observed in the F_3 of the cabbage-butterhead group. From the commercial viewpoint the most promising crosses were New York × Hanson and Golden Yellow Stonehead × Early Butternut.

Changes accompanying fruit development in the garden pea, C. S. Bisson and H. A. Jones (*Plant Physiol., 7 (1932), No. 1, pp. 91–105, figs. 5*).—Data taken at the California Experiment Station on Dwarf Telephone peas harvested at different stages of maturity showed an increase in weight up to about the thirty-second day, after which there was a decrease due to moisture loss. The average dry weight increased throughout the entire growing period. In the pod itself the absolute weights of nitrogen, total sugars, starch, and ash reached an early maximum, while in the pea there was an increase in absolute weight of nitrogen, starch, crude fiber, and ash throughout the entire growth period. The absolute weight of sucrose reached its maximum about the thirty-second day and then declined rapidly. Crude fiber increased in absolute weight throughout the entire period in both pod and pea.

In conclusion the authors assert that sucrose is the most important constituent determining sweetness in the garden pea. The percentage of sucrose was highest in peas before they reached harvesting size, whereas maximum total weight of sucrose concurred with harvesting.

Rapidity of response of spinach to change in photoperiod, J. E. Knott (*Plant Physiol., 7 (1932), No. 1, pp. 125–130*).—Using two varieties of spinach, namely, Virginia Savoy and Old Dominion, it was found in these studies at the New York Cornell Experiment Station that changes in the photoperiod induced changes in the catalase activity of both varieties, but more quickly in the Virginia Savoy, the variety with the greater tendency to produce early seed stalks.

Uniformity of maturity and size of ears of hybrid sweet corn compared with commercial strains, E. S. Haber (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 352–355*).—Records taken at the Iowa Experiment Station on the weight of ears and the time of ripening of commercial strains of sweet corn and of hybrids resulting from combining selfed lines showed the latter to yield larger and more uniform ears and to be much more uniform in ripening. A method of crossing in which selfed lines were crossed with a selected commercial strain was employed for testing the inherent value of the selfed strains.

The effect of leaf pruning upon the yield of greenhouse tomatoes, I. C. HOFFMAN (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 360–362*).—Records taken at the Ohio Experiment Station upon the yield of tomatoes from plants pruned to various degrees of severity showed a decrease in yield both in number and in weight of fruits in proportion to the severity. Plants with all leaves removed below the first cluster and then one week later all leaves below the second cluster yielded 18 per cent less than did the unpruned controls. However, when pruning was delayed until the earliest fruits of the first cluster were half grown, the loss from pruning was not so great. Leaf pruning also retarded ripening very materially.

Catalase activity in tomato fruits at different stages of their development, F. G. GUSTAFSON, I. CLARK, D. A. SHAW, and E. WARWEG (*Plant Physiol., 7 (1932), No. 1, pp. 155–160, fig. 1*).—Seeking to determine if correlation exists between growth, respiration, and catalase activity in tomato fruits, catalase determinations were made at the University of Michigan upon tomato fruits in various stages of development. A general although irregular increase in the amount of oxygen liberated accompanied increased rates of growth. There was also a general agreement between catalase activity and respiratory activity; hence it is concluded that respiration, growth, and catalase activity apparently proceed hand in hand.

Recent developments in nursery variety certification, J. K. SHAW (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 82–84*).—Certain of the details concerned with the certification of varieties of young nursery trees as determined at the Massachusetts Experiment Station are discussed. No method was found of distinguishing between varieties and their bud sports or mutations in apples, nor could Ben Davis be distinguished from Gano. Sweet cherries offered unusual difficulties because of mazzard stocks growing up from unsuccessful buds, and peaches were as a rule found difficult to identify.

Granulated peat moss in field propagation of apple and quince stocks, H. B. TUKEY and K. BRASE (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 106–108, pl. 1*).—At the New York State Experiment Station German peat moss spread between the rows at the rate of one-half bale to a row 60 ft. long and 4 ft. wide increased the percentage of well-rooted layer plants of apple and quince stocks as compared with untreated plants. The moss-treated plants were superior in number, length, and diameter of roots. The results were particularly favorable with the apple, naturally less free rooting than the quince.

Pollination experiments in west Germany [trans. title], H. SCHANDERL (*Gartenbauwissenschaft, 6 (1932), No. 2, pp. 196–239, figs. 10*).—Peaches and apricots were found self-fruitful and capable of setting in weather unfavorable to insect movement. All of 14 sweet cherries, 25 pears, and 31 apples were practically self-unfruitful. Of 8 sour and partly sour cherries all were fully self fruitful except the Königlichen Amarelle. The large green Reine Claude, the Graf Althan Reine Claude, the Italian prune, and the Nancy, Metz, and Flotow Mirabelle plums were all self-fruitful. On the basis of pollen germination tests it was found that apples and pears could be easily divided into two groups, namely, good and poor pollen producers. It is suggested that two compatible pollinizers should be provided for each unfruitful pear or apple tree.

A progress report of studies on fruit tree irrigation, [I, II] (*Wash. State Hort. Assoc. Proc., 27 (1931), pp. 125–136, figs. 4*).—These studies are reported in two parts.

I. *Soil moisture studies*, C. A. Larson (pp. 125–130).—Measurements by the Washington Experiment Station of the amount and location of water in the soil following light, medium, and heavy irrigations in an apple orchard located at Prosser on a fine sandy loam soil cover cropped with alfalfa indicated that

40 acre-in. for the season, applied at intervals, is an adequate application to secure favorable results. Where larger quantities were used, there was leaching beyond the root zone and considerable surface run-off with no resulting benefit.

II. *Tree and fruit responses*, L. L. Claypool (pp. 131–135).—Observations on the apple trees in the above irrigation experiment showed that trees receiving a seasonal application of 30 acre-in. of water and irrigated at 15-day intervals were wilted during most of the day several days prior to irrigation. These trees made the least increase in trunk diameter. Trees receiving 30 acre-in. of water at 30-day intervals suffered less and made somewhat more growth. Trees receiving 40 acre-in. of water made approximately the same growth as trees receiving either 48 or 60 acre-in. Terminal growth and leaf area measurements yielded much the same information, and when size of fruit was considered 30 acre-in. applied at 15-day intervals was inadequate to develop the fruit properly. There was some slight gain in the amount of color with the minimum water application, but the quality of the color was better where sufficient water was used. The cover crop behaved in a comparable manner to that of the apple trees.

Direct tree injection in the study of tree nutrition problems, R. C. Collison, J. D. Harlan, and M. P. Sweeney (*New York State Sta. Tech. Bul. 192 (1932), pp. 36*).—Stating that a method of direct injection of nutrients into the plant might, if practical, greatly aid in the solution of nutrition problems, the authors discuss results secured with various materials introduced into apple and cherry trees in different amounts and concentrations. Several distinct limitations were encountered, among them being that vertical flow was rapid and radial movement so slow that limbs and branches nearest the point of injection received practically all the solution and could be injured before the rest of the tree was affected. Also it was evident that tissues apparently resisted the entrance of salts, soon becoming practically impervious. Pure water was absorbed much faster and over a longer period than were salt solutions.

Of the different nitrogen materials injected, a solution of urea when used in equivalent amounts of actual nitrogen caused much less injury than various nitrates. Cane-sugar solution entered the tree much more slowly than did inorganic salts and in the amount used caused no injury. Cane sugar reduced the injurious effect of magnesium nitrate when the two were combined. Excess salts in injured and abscised leaves suggested that the tree eliminates such material through its foliage. Injury was greater in younger tissues and increased in extent and rapidity with the concentration of the salts.

Statistical analyses of the results of chemical determinations of nitrogen in shoots and leaves showed that a large number of samples are required to give dependable information; so many in fact, that the authors believe that tissue sampling presents a serious difficulty with the injection method and as a matter of fact with any type of research in which samples of leaves, spurs, or terminals are removed for analysis. Furthermore, repeated injections through borings tended to weaken the tree.

Further evidence of a potash-lime deficiency in a sandy loam soil, J. K. Shaw (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 12–14*).—Reporting farther (E. S. R., 54, p. 740) on fertilizer studies with fruit trees at the Massachusetts Experiment Station, the author presents data showing that liming of a certain soil actually decreased the growth of apple trees, except on plats where potash was also applied. Weekly determinations of soil nitrates in the summers of 1925 and 1926 showed only slight differences between the limed

and unlimed areas, and determinations of total nitrogen of soil taken in January showed slightly more nitrogen on the limed than unlimed plats.

When soil taken from the several plats was transferred to Wagner pots and used for growing peach seedlings, about the same results were secured as in the field. Where lime was added to soil from the potash and phosphorus plats and from the no fertilizer plat, it was observed in August readings that both the pH value and soil nitrates rose with increased amounts of lime. However, direct applications of sodium nitrate with and without phosphorus only slightly improved growth, leading to the conclusion that the factor limiting tree growth in this soil is acidity, closely followed by a lack of sufficient potash.

Physical and chemical changes in the ripening of deciduous fruits, F. W. ALLEN (*Hilgardia [California Sta.], 6 (1932), No. 13, pp. 381–441, figs. 3*).—Measurements made on several varieties of plums, peaches, pears, and the Gravenstein apple showed all to increase in size after reaching the customary picking maturity. As concerned coloring after picking, apples, peaches, pears, and apricots required sunlight for developing red color, while plums developed full color even when picked only slightly red. The rate of softening, as measured by the pressure tester, was found a reliable index to ripening changes, and following picking was primarily dependent upon temperature.

Plums, peaches, and pears all showed an increase in soluble solids with ripening on the tree, the quantity being approximately twice that of the total sugars. All fruits examined showed a material gain in sugar content as the fruit colored on the tree. Apples and pears showed a starch decrease and a sugar gain after picking. During ripening on the tree the acid of apricots, apples, and most plums and peaches decreased, but in certain peaches and in Bartlett pears from certain districts the acid increased.

Conductivity tests showed an increase in specific resistance of Bartlett pears while maturing on the tree and after picking until the flesh became overripe, when resistance dropped rapidly. Ethylene gas hastened softening and increased the color of Bartlett pears and Gravenstein apples. Ethylene decreased somewhat the starch and acid contents of Gravenstein apples but had practically no effect on sugar or acid content of Bosc and Winter Nelis pears.

Home orchard income, T. J. TALBERT (*Missouri Sta. Bul. 307 (1932), pp. 12, figs. 2*).—Tabulated data are presented on the cost of planting, developing, and maintaining a three-fourths acre home orchard from 1919 to 1931, inclusive, and upon the returns from the orchard during this period. Suggestions as to the proper spacing, location, and choice of varieties and species are given.

"The results from this investigation indicate very forcefully that for Missouri conditions the average farm should not maintain a home orchard of more than three-fourths of an acre, while an orchard of one-half acre or less is likely to prove more profitable. With proper care and attention, no similar area on the farm is likely to produce for the time and effort employed as great returns to the yearly food supply of the family and as much genuine enthusiasm and satisfaction as the home orchard."

A study of the progeny resulting from crossing certain apple varieties, D. A. KIMBALL (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 412–415*).—An analysis is presented of apple seedlings resulting from the following crosses made in 1914 at the Ontario Agricultural College: Wealthy × Wagener, Wealthy × McIntosh, Ontario × McIntosh, and McIntosh × Northern Spy. Northern Spy apparently transmitted vigor of growth and favorable flesh texture to its progeny, but as a whole is deemed an undesirable parent. McIntosh yielded a considerable proportion of small-fruited seedlings, but because of the transmission of red color and high quality is classed as a very desirable parent. Ontario evidently carried a factor for large size fruit and desirable texture,

but gave too much acidity and too little red color. Wealthy transmitted good size, red color, and early fruiting, and is considered desirable in breeding early varieties. Wagener apparently carried factors for early bearing and large size, but is believed to be replaceable by other varieties carrying fewer undesirable characters.

Some effects of late spring frosts upon the viability of apple pollen, W. E. LOMMEL and L. GREENE (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 404, 405*).—Official minimum temperatures of 30 and 31° F. recorded by the Indiana Experiment Station on April 24 and 25, 1930, while apple trees were in bloom, were accompanied by considerable damage as evidenced by pollen gathered April 26 from blossoms in various stages of development and tested in sugar solutions for viability. Pollen from unopened buds showing no pistil injury showed strong viability except in the case of the Stayman Winesap. Unopened buds with dead pistils yielded a high percentage of viable pollen in Delicious, Grimes, and Jonathan and less than 40 per cent in the Rome variety. Unopened Delicious buds with dead pistils and brown anthers and filaments contained a high percentage of viable pollen, while Jonathan buds in the same condition yielded only an occasional germinating grain of low vigor. Delicious was the only apple to yield even a fair percentage of viable pollen from opened blooms with dead pistils. Rome pollen was apparently injured to a greater extent by cold than that of any other variety.

Pollination of the McIntosh apple, F. M. HARRINGTON and W. E. POLLINGER (*Montana Sta. Bul. 256 (1932), pp. 12*).—Pointing out the fact that a serious pollination problem has arisen in many Bitterroot apple orchards through the elimination of all varieties except McIntosh, the authors present the results of cross-pollination studies made to determine compatible pollinizers for this variety. In 1924, a very favorable pollinizing season, Delicious, Gano, Jonathan, Wealthy, McIntosh, and Transcendent gave sets of 57.5, 53.1, 63.7, 63.7, 20, and 0, respectively, on McIntosh. In 1926, an unfavorable season, the results with the same varieties were 13.5, 14.6, 13.3, 17.3, 0.2, and 0, respectively, indicating that McIntosh is unreliable and Transcendent useless. That the condition of the tree and of the soil has an important bearing on fruit set was shown in the fact that the best set of fruit and the lowest drop occurred on trees of highest vigor. In 1930 and 1931 the highest set and the least drop in McIntosh occurred in the nitrogen plus phosphorus plats. Unfavorable weather at blooming caused greater reductions in set in solid McIntosh blocks than where Delicious trees were interspersed, and McIntosh trees adjacent to other varieties set better than isolated trees.

Pollination of certain apple bud sports in north central Washington, E. L. OVERHOLSER and F. L. OVERLEY (*Wash. State Hort. Assoc. Proc., 27 (1931), pp. 70–74*).—Data are presented in tabular form on the response observed by the Washington Experiment Station of Delicious, Winesap, Richared, and Starking apples to various kinds of pollen. Richared, Starking, and Shotwell Delicious, all bud mutations of Delicious, behaved practically the same as Delicious. These three varieties were practically intersterile with Delicious and also with one another, but all pollinated Winesap satisfactorily.

Studies on the beginning period of the growth and the rest period of apple root [trans. title], Y. OTUKA (*Research Bul. Agr. Expt. Sta. So. Manchuria Ry. Co., No. 5 (1931), pp. 1–11, pls. 10*).—Observations at the Yugakujio Agricultural Experiment Station in southern Manchuria upon the root development of trees of *Malus baccata mandshurica* showed roots to cease growth in length when the soil temperature at a 30-cm depth dropped below 7° C. and to resume growth in early spring when the soil temperature reached 6.

Some responses of Grimes and Jonathan to thinning, C. W. Ellenwood (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 281–285*).—Thinning at the Ohio Experiment Station of the fruit of mature Jonathan and Grimes apples in their heavy fruiting year proved of material benefit in increasing fruit size. In the case of Jonathan thinning had less marked effect on color than on size but did increase the percentage of fancy grade fruit and decreased the proportion below U. S. No. 1 in color. No economic gain resulted from thinning Jonathans to distances greater than 8 in. Thinning unpruned trees to 10 in. gave about the same response in fruit size as did thinning of pruned trees to 8 in., but the fruit of unthinned pruned trees was better colored than that from unpruned trees thinned to either 8 or 10 in.

Thinning Jonathans to 8 in. allowed an average of 43 leaves per apple, deemed to be about the minimum needed to insure sufficient size and color. It is emphasized, however, that girdling was not practiced, and there may have been translocation of nutrients. Very marked benefits were secured from thinning Grimes apples in the extremely dry season of 1930.

Growth record of fertilized apple trees grown in metal cylinders, R. D. Anthony and W. S. Clarke, jr. (*Jour. Agr. Research [U. S.], 44 (1932), No. 3, pp. 245–266, figs. 4*).—Measurements taken at the Pennsylvania Experiment Station on Stayman Winesap apple trees propagated on a clonal rootstock and grown in large metal cylinders filled with carefully prepared soil showed highly distinctive responses to differential fertilizer and soil treatments, much sooner than could have been expected from larger and unconfined trees. In general the results from fertilizer and soil treatments were similar to those obtained in field experiments; that is, sod without supplemental nitrogen checked decidedly the growth of trees. However, sod-grown trees receiving nitrogen alone or nitrogen plus phosphorus made nearly as good growth as did cultivated trees receiving the same treatments. Cultivation alone was not equal to cultivation plus nitrogen. Phosphorus applied to trees growing in sod increased their growth beyond that of untreated checks. The addition of phosphorus to nitrogen did not produce a definitely better growth than nitrogen alone, but phosphorus added to nitrogen and potash for trees in sod did influence growth favorably. Potash added to nitrogen or to phosphorus or to both did not modify the growth of trees but had some apparent beneficial effect on the setting of fruit.

Very strong correlations, above 0.8, were computed between various types of growth, notably trunk diameter, weight of the tops, weight of roots, and length of shoots. Blossom production and yield of fruit were most closely correlated with total branch elongation and bearing surface and less so with tree growth.

A nonanticipated early escape of tree roots beneath certain rims is cited, with the belief expressed that the decreased accuracy resulting from this circumstance did not materially influence the relative nature of the records.

Some relationships between soil properties and performance of Baldwin and Greening apple trees, R. C. and S. E. Collison and J. D. Harlan (*New York State Sta. Tech. Bul. 194 (1932), pp. 19*).—A critical study made of the soil beneath 30 Rhode Island Greening and 22 Baldwin apple trees, the fruiting performance of which during the preceding 10 years was known, showed striking relationships between certain soil properties and yield of fruit in the Baldwin, yields being positively correlated with the sand content and negatively with the silt content and the exchangeable calcium oxide in the soil. Rhode Island Greening, on the other hand, seemed to be little influenced by any of the soil properties studied, apparently having a much wider soil adaptation than did Baldwin. A slight correlation was found in Baldwin between

yield and the total carbon of the soil and with the amount of water that the soil held at the sticky point. Since the sticky point is determined to a large extent by the amount of exchangeable calcium present, the authors believe that the structure and properties of soil colloids are apparently more important factors in affecting Baldwin yields than is the total quantity of such colloids. Apparently certain characteristics of soil colloids may be very important in determining the fruiting performance of plants.

Red pigment production in apples by means of artificial light sources, J. M. Arthur (*Contrib. Boyce Thompson Inst., 4 (1932), No. 1, pp. 1–18, pl. 1, figs. 4; abs. in Amer. Jour. Bot., 18 (1931), No. 10, p. 896*).—In a study at the Boyce Thompson Institute it was found that both the infra red and far ultraviolet regions of the spectrum produce injuries on apples, whereas light with little infra red or red with considerable ultra-violet extending as far as the solar limit at wave length 290 mμ is ideal. McIntosh apples were well colored by exposure for 48 hours to a mercury vapor lamp in uviol glass placed sufficiently distant from the apples to avoid injury from either ultra-violet or infra red rays. Excised peel heated or immersed in alcohol failed to color, indicating that coloring is a function of living cells. The date of exposure was also a factor, coloring of green fruit under artificial light being most rapid on fruit picked green on August 25 and declining thereafter.

The removal of arsenical residue from apples, R. S. Snyder and H. P. Magnuson (*Idaho Sta. Bul. 187 (1931), pp. 20*).—Alkali solutions were found nearly as effective but slower than dilute hydrochloric acid in the removal of spray residues. At ordinary temperatures the most efficient removal occurred after 6 minutes in alkali and after 4 minutes in acid, but the rate was speeded up by increasing the concentrations or the temperature of the solutions. Where fruit was washed immediately following picking the use of 0.33 per cent hydrochloric acid was sufficient to remove the arsenical residue from nonoil-sprayed apples, whereas at least 0.66 per cent hydrochloric acid was required to remove residues from oil-sprayed apples washed immediately after picking. An increase in wax secretion on apples held in common storage greatly augmented the difficulty in removing spray residues.

The addition of 1 per cent of common salt to acid solutions gave erratic results, but in general there was a slight improvement in the removal of residues. Kerosene emulsions were useful supplements to hydrochloric acid when added to warm solutions, but because of the disagreeable odor imparted to the fruit are recommended only in case of heavily waxed fruits. Temperatures of 95 to 105° F. in the washing solution were found satisfactory in cleansing and not injurious to the keeping quality of the fruit. The use of oils with viscosities higher than 65 to 75 was found to cause considerable difficulty in removing the arsenicals. When oils were used more than twice in the cover spray program or if used after July 25 they added to the difficulty of spray removal.

Varieties differed in their ease of cleansing, Rome Beauty cleaning more easily than Delicious and Winesap. Practical suggestions are given on the preparation and use of cleansing solutions and supplements.

Studies on the effects of certain treatments on the young oriental pear trees [trans. title], M. Ohsaki (*Imp. Hort. Expt. Sta., Okitsu, Japan, Research Bul. 16 (1931), pp. 20; Eng. abs., pp. 18–20*).—In studies at the Imperial Horticultural Experiment Station, Okitsu, Japan, 1-year-old pears (*Pyrus serotina*) were pruned in different degrees of severity at the time of transplanting. Observations two years later showed that the number of new shoots was decidedly decreased by heavy pruning but that the length per shoot was increased. The ratio of roots to the whole plant was largest in the control

trees and lowest in the most severely pruned group. In another experiment summer pruning reduced the weight of the trees when dug at the end of the second year. A comparison of immediate with delayed planting showed distinctly in favor of prompt planting.

Statistical study of the total nitrogen in Bartlett pear shoots, A. S. MULAY (*Plant Physiol., 6 (1931), No. 2, pp. 333–358, figs. 5*).—Analyses made at the California Experiment Station of shoots from 5-year-old and from 30-year-old pear trees showed considerable difference in the extremes of the total nitrogen, both in the bark and in the wood. The number of shoots required to give reliable values was determined, and it was found that from 35 to 40 were required to give odds of 142:1 that the true value lay within ±5 per cent of the observed point. Shoots collected from several trees differed in variability very little from those of a single tree. Bark was in general more variable than wood, and shoots selected by color were less variable than those taken at random. Shoots collected in 1927 were similar in variability to those collected in 1928.

Seasonal changes in the composition of the non-protein nitrogen in the current year's shoots of Bartlett pear, A. S. MULAY (*Plant Physiol., 7 (1932), No. 1, pp. 107–118, figs. 7*).—Having previously shown significant quantitative changes in nonprotein nitrogen (E. S. R., 65, p. 639) in pears, further studies were made at the California Experiment Station to determine which fractions changed. Starting with a high concentration of amide and amino nitrogen in both bark and wood, there was noted a decline, as growth progressed, to a minimum in autumn and winter. Amide nitrogen in wood was much higher during the period of active growth than was amino nitrogen. Basic nitrogen was lowest in June, reached a maximum some time before new growth started, and then declined rapidly. Upon hydrolysis, humin nitrogen in the bark and rest nitrogen in the wood decreased considerably, accompanied by a concurrent rise in amide, amino, and basic nitrogen.

Germination and storage of wild plum seeds, J. GIERSBACH and W. CROCKER (*Contrib. Boyce Thompson Inst., 4 (1932), No. 1, pp. 39–51, fig. 1; abs. in Amer. Jour. Bot., 18 (1931), No. 10, p. 890*).—Repeated germination tests made at the Boyce Thompson Institute upon *Prunus americana* seeds stored dry under various conditions showed in favor of a moderate temperature, 8° C. (46.4° F.), as compared with room and higher storage temperatures. Seed from a heated cabinet lost all viability after 50 months, whereas seed from room temperature was 16 per cent viable and that from 8° storage was 45 per cent viable at the end of 53 months. The drying of seed for 19 days over sulfuric acid and quick lime slightly reduced germination.

Relation of specific gravity to the quality of dried prunes, P. F. NICHOLS and H. M. REED (*Hilgardia [California Sta.], 6 (1932), No. 16, pp. 561–583, figs. 9*).—Working with French prunes obtained from packing houses in the four principal growing districts of California, the authors found that specific gravity as determined by comparing weight in air with that in a mixture of xylene and carbon tetrachloride and weight per volume were useful indexes to flesh texture in dried prunes. The color of the flesh was found to be closely associated with texture, and the tests for color were based on texture because it was more easily and satisfactorily measured. Both the specific gravity and the weight per volume tests chiefly reflected the fact that increasing porosity of the flesh decreases the weight of prunes of given size or volume. The specific gravity test appeared to be least affected by interfering characteristics, such as stickiness of the fruit. Weight per volume, on the other hand, had the advantage of using larger samples, of not affecting the immediate usefulness of the sample, and of discriminating against sticky fruits. Temperature had a

much more pronounced effect upon weight per volume than upon specific gravity. Fruit was less sticky at 32 than at 70° F., and the factor of stickiness is believed to account for the fact that the association between specific gravity and weight per volume was not closer.

Heat requirements of peaches and cherries [trans. title], G. RIVIÈRE and G. PICHARD (*Bul. Mens. Soc. Natl. Hort. France, 5. ser., 4 (1931), Dec., pp. 674–679*).—A study of records taken on peach and cherry trees of several different varieties growing under controlled conditions in the greenhouse of the agricultural experiment station at Versailles, France, indicated that temperatures above 14° C. (57° F.) are ineffective for the cherry up to the foliation stage and for the peach up to the flowering stage in accelerating the rate of development. Contrary to the usual behavior of the peach outdoors, the trees in the greenhouse developed their leaves from 3 to 8 days in advance of flowering. The effects of light and of heat apparently supplemented one another and to a certain degree were compensating. Despite the fact that light intensity was less in the greenhouse than in the open, peaches required less time to mature their fruits. The most rapid development was correlated with the highest mean temperature and the strongest insolation. The following coefficients of solar radiation were utilized: January 1.1, February 1.8, March 3.05, April 4.75, and May 5.6.

Factors in the production of cherry trees in the nursery, H. B. TUKEY and K. BRASE (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 88–92, pl. 1, fig. 1*).—As recorded in an investigation at the New York State Experiment Station, the respective percentages of living Montmorency trees at the end of two years were 54.1, 49.1, 0, and 0, respectively, for mahaleb, mazzard, Tomentosa, and Virginiana rootstocks. Considerable variation was noted in mazzard and mahaleb stocks. Graded to size, No. 2 mahaleb (3/16 to 5/16 in.) gave better stands than did either larger or smaller stocks. Comparing the inverted T with the erect T type of incision for budding, no differences were noted. Spraying with Bordeaux mixture was found highly beneficial in preventing defoliation of mazzard stocks and thereby increasing the stands and reducing winter injury.

An easy means of distinguishing the roots of mazzard and mahaleb, W. H. UPSHALL (*Amer. Soc. Hort. Sci. Proc., 27 (1930), p. 87*).—The inner bark when exposed to air by slicing with a knife was found at the Vineland Horticultural Station, Ontario, in the case of mazzard cherries to be xanthine orange darkening to a burnt sienna and in the mahaleb cherry to be a cinnamon which did not materially change. Nursery mazzards developed more fine roots than did mahalebs, and mazzard roots one or two years old showed a distinct brown trace in their surface color.

Some experiments in transplanting sweet cherry trees, W. H. UPSHALL (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 259–264*).—At the Vineland Horticultural Station, Ontario, one lot of fall planted sweet cherry trees made 30 per cent more growth the subsequent season than did spring planted, freshly dug trees and 50 per cent more growth than spring planted storage trees. No consistent or significant advantage was obtained from waxing cuts or whole trees, and where vaseline was added to the wax some bark injury followed. Based on growth the year of planting, there was a gain in favor of pruning at planting over no pruning, but the difference between heavy and light pruning was insignificant. In a subsequent experiment where a very dry summer followed planting, heavy pruning had a tendency to increase survival. In the spring dug lot seven out of ten heavily pruned trees survived as compared with two and three, respectively, for lightly pruned and unpruned lots. In a test in

which one-year-old trees were compared with two-year-old trees the latter showed somewhat better survival.

Pollination studies with cherries [trans. title]. H. KRÜMMEL (*Gartenbauwissenschaft, 6 (1932), No. 3, pp. 262–302, figs. 2*).—Further evidence was obtained at the Institute for Plant Culture and Improvement at Halle, Germany, that self-sterility is, with few exceptions, the rule in sweet cherries, whereas in the Weichsel group partial sterility is more often the case. In the sweet cherry inter-sterility was reciprocal in all cases observed, and in the majority of instances all members of an inter-sterile group were mutually inter-sterile. Sweet cherries were generally better pollinizers for the Weichsels than vice versa. The Weichsel cherries Bettenburger Glaskirsche and Schöne von Chatenay were found fully self-fertile. A number of cases of inter-sterility in sweet cherries are recorded.

Washington sweet cherry pollination studies in 1931. L. L. CLAYPOOL, F. L. OVERLEY, and E. L. OVERHOLSER (*Wash. State Hort. Assoc. Proc., 27 (1931), pp. 171–174*).—Asserting that some of the cherries found capable of pollinating valuable commercial varieties are in themselves of little value, tests were conducted at the Washington Experiment Station to discover capable pollinizers that might also have good selling value. Deacon, Black Tartarian, Black Republican, Norma, and Montmorency proved excellent pollinizers for Bing and Napoleon and with the exception of Norma for Lambert. Deacon, though self-unfruitful, is considered outstanding as a pollinizer because of its market value.

Physiological studies of the cracking of sweet cherries. L. VERNER and E. C. BLODGETT (*Idaho Sta. Bul. 184 (1931), pp. 15, figs. 3*).—Despite the assumption that soil moisture is a factor in the cracking of ripe cherries, no evidence was observed in irrigated cherry orchards near Lewiston that soil moisture in itself or together with rain had any effect on cracking. Cherries on branches protected from rain showed no cracking, regardless of irrigation treatments, while cherries on unprotected limbs of the same tree suffered much injury. When cut ends of branches were placed in water no cracking of fruit occurred.

When Napoleon, Bing, and Lambert cherries harvested at different stages of maturity were plunged into tap water there was observed a definite correlation between the amount of cracking and the sugar content of the juice, suggesting that the absorption of water through the skin was directly correlated with the osmotic concentration of the juice. This hypothesis was further borne out by the fact that in the case of cherries immersed in sugar solutions the volume increased and the amount of cracking varied inversely with the concentration of the solution. The temperature of the water in which cherries were immersed also proved to be an important factor in increasing the rate of cracking.

Of the three varieties Bing proved much more susceptible to cracking than either Napoleon or Lambert, apparently because of a higher sugar content at maturity and also because in the Lewiston district Bing ripened in the height of the rainy period. In a test of resin fish oil soap as a protectant against cracking, no positive results were secured.

Pruning experiment with peach trees [trans. title]. H. NIITSU and M. OHSAKI (*Imp. Hort. Expt. Sta., Okitsu, Japan, Research Bul. 15 (1931), pp. 48, pls. 10; Eng. abs., pp. 45, 46*).—At the Imperial Horticultural Experiment Station, two lots of 1-year-old peach trees headed, respectively, at 30 cm and 60 cm were pruned in different ways. In all treatments the trees headed at 30 cm were more vigorous and more fruitful. Growth and yield were more or less

directly proportional to the severity of the pruning in the 30-cm trees, whereas in the 60-cm trees there was no significant difference according to severity of pruning. Thinning of branches as compared with heading resulted in larger tops, more shoots, and more fruits.

Thinning peaches and related problems in North Carolina, J. H. Beaumont (*Peninsula Hort. Soc. [Del.] Trans., 45 (1931), pp. 109–115*).—The importance of adequate soil moisture for the sizing of peaches was shown in records taken by the North Carolina Experiment Station on the fruit of trees located in dry and irrigated plats. At harvest the dry plat fruits averaged 64.7 cm^3 in volume as compared with 127.2 cm^3 for the irrigated fruits. On July 15 there was 1.37 and 4.36 per cent of moisture in the first foot of soil in the dry and irrigated plats, respectively. Sandy soils such as used were found to retain only one-half and one-third as much water against gravity as did truck and compost soils, respectively. Sand hills soils actually held only about 25 per cent of their weight of water. On the other hand, only about 2 per cent of the moisture was left in the sandy soil when the plants wilted as compared with from 8 to 18 per cent in other soils. Sandy soil contained only from 0.5 to 1.9 per cent of organic matter or volatile substances. Digging of 10 and 20 lbs. of straw per 25 sq. ft. into the top soil increased both the total soil moisture and the water-holding capacity.

Fruit thinning is deemed of utmost importance in regulating the crop to the capability of the trees. Little difference in size was observed whether thinning was done 63 or 36 days prior to the first picking.

Varieties of berries, G. M. Darrow (*Wash. State Hort. Assoc. Proc., 27 (1931), pp. 183, 184*).—Brief comments are presented on some of the important and promising varieties of raspberries, blackberries, and strawberries.

Gentes Herbarum.—Art. 12, The blackberries of North America, L. H. Bailey (*Ithaca, N. Y., 1932, vol. 2, No. 6, pp. 269–423, figs. 36*).—In connection with a general discussion and key, technical descriptions are presented of a large number of species, species hybrids, and subspecies.

Some raspberry varieties being used as parents in breeding, A. S. Colby (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 422–424*).—A general discussion is presented upon the results of selfing and cross-pollination experiments at the Illinois Experiment Station with black and red raspberries. In some cases selfed seedlings proved superior to the parent in fruit or cane characters or in both. Among blackcaps Quillen was by far the most useful parent, and Quillen × Latham yielded an outstanding purple-fruited seedling. Plum Farmer × June was a successful combination, whereas the reciprocal cross yielded no meritorious seedlings.

Propagation studies with the black raspberry, J. S. Shoemaker (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 142–145*).—Based on the results of extended trials at the Ohio Experiment Station, the most satisfactory methods of layering and of handling young black raspberry plants are outlined.

A planting of 830 Cumberland raspberries produced 4,908, 21,408, and 31,125 tip plants the first, second, and third years, respectively, and in addition many of the laterals produced more than one tip plant by branching. Up to 10 canes per hill, the greater the number of canes produced one year the greater the number produced by the same hills the next season. If canes were allowed to reach 3 ft. before checking, the branches usually failed to reach the soil or were in poor condition for tip layering.

Effects of different methods of pruning raspberries on earliness, weight of fruit, and yield, H. D. Locklin (*Wash. State Hort. Assoc. Proc., 27 (1931), pp. 185–189*).—Hill-grown 6-year-old nonirrigated Cuthbert raspberries at the Western Washington Experiment Station were so pruned that part of the

canes in each hill were topped and part trained without pruning. For the first six pickings the long canes produced the greatest total yield and the topped canes the heaviest berries. For the entire season the topped canes produced fruit of larger average weight, but the largest number of berries and the greatest total weight was produced by the long canes. Dividing canes into bud sections, the third and fourth sections from the base yielded the greatest total weight of berries in both types of pruning. Sections two and three yielded berries of the greatest average weight. In general canes having the greatest basal diameter yielded the largest crop.

Comparison of root and top development in varieties of strawberry, H. C. Hanson (*Amer. Jour. Bot., 18 (1931), No. 8, pp. 658–675, figs. 7*).—Observations at the Colorado Experiment Station on the root and top growth of 18 varieties of strawberries growing under irrigation showed in general a relationship within any single variety between root and top growth, i. e., varieties with strong tops possessed sturdy root systems and those with poor top growth generally had poor roots. There were certain exceptions: Belt had poor roots and a fair top, Chaska had strong roots and only a fair top, and Oelrich fair roots and poor tops.

In general the root systems were shallow, the maximum depth ranging from 10.5 in. in Aroma to 40 in. in Mastodon. The maximum lateral spread from the crown ranged from 12 to 40 in. The number of runners was usually few. The varieties are grouped by the author into classes according to the development of their root and top systems.

The fertilization of strawberries in Maryland, A. L. Schrader (*Peninsula Hort. Soc. [Del.] Trans., 45 (1931), pp. 19–25*).—As reported by the Maryland Experiment Station, Missionary strawberries to which were applied in the spring of the first fruiting year 600 lbs. per acre of a 0–8–5 fertilizer yielded 7,950 qt. as compared with 7,284 qt. for the control. An application of 600 lbs. of 10–0–0 fertilizer actually decreased marketable yields by retarding maturity beyond the harvest season. Where lime was applied before planting in sufficient quantity to meet the lime requirements of the soil, yields were materially depressed. In another test where 400 lbs. of fertilizer per acre was applied in the early spring of the first fruiting year, a 5–8–0 material increased yields 737 qt. above the control.

Results of three years' studies with three varieties showed that fertilizer did not have an injurious effect on keeping or shipping quality as measured in the percentage of soft or decayed berries or changes in pectin. Nitrogen applied in the spring of the fruiting year increased the size of berries to a moderate degree.

Grape districts and varieties in the United States, G. C. Husmann (*U. S. Dept. Agr., Farmers' Bul. 1689 (1932), pp. II+33, figs. 10*).—Stating that there are three major types of grapes grown in the United States, namely, the vinifera, the American euvitis, and the muscadine, the author sets forth in a general way the distribution of the several groups and makes recommendations as to selection of site, cultural requirements, etc., and describes some of the important varieties in each of the three groups.

The effect of fruiting on the shoot growth of the Concord grape, A. L. Schrader (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 170–174*).—The removal at the Maryland Experiment Station on May 22, 1930, of all clusters from selected shoots resulted in an average growth of 240.5±9.4 cm, as compared with 206.6±9.1 cm for shoots with no clusters removed. Where one cluster was left per shoot its average weight at harvest was 3.98±0.12 oz., as compared with an average of 2.86±0.07 oz. where all clusters were left. Deferring defloration until June 3 resulted in a slight increase in shoot length.

Where all the clusters were removed from the entire vine the average increase in length of selected shoots was 208.3±16.6 cm, as compared with 157.4±11.7 cm for shoots on vines in which all clusters were left and 164.3±7.2 cm where defloration was deferred until after fruit setting. Concerning the relation of the position on the cane to the weight of clusters, weights of fruit from untreated shoots showed the bunches to decrease in size from the base to the tip.

The fact that individual shoots on bearing vines were affected by blossom or cluster removal is evidence of some degree of individuality in grape shoots. Since cluster thinning before setting was more effective than thinning after setting, the author recommends that if cluster thinning is to be employed it should be done early.

Some studies in respiration and other metabolic activities in berries of the grape vine (Vitis vinifera, Linn), J. C. LUTHRA and I. S. CHIMA (*Indian Jour. Agr. Sci., 1 (1931), No. 6, pp. 695–714, figs. 5*).—Determinations at the Punjab Agricultural College, Lyallpur, India, of the rate of respiration in grapes of different stages of maturity showed a very active respiration during the early stages of growth, with a slowing down toward maturity. The accumulation of sugars associated with ripening seemed to retard respiratory activity, a coefficient of correlation of −0.52±0.14 being computed between respiratory activity and content of reducing sugars in one variety. The coefficient of correlation between sugars and acids was −0.78±0.08 in the same variety. The rate of respiration was the same in berries detached from the vine or on the vine. No noticeable difference was observed between day and night readings. The maximum reducing sugar content coincided with complete maturity. Total titratable acidity increased for 4 or 5 weeks and then declined. Nitrogen content declined until the forty-seventh day after blooming, whereas water-insoluble residue and cellulose remained practically constant throughout the life of the berries. Specific gravity of the juice closely followed the increase in sugars.

The structure and development of flowers in Ficus carica L., I. J. CONDIT (*Hilgardia [California Sta.], 6 (1932), No. 14, pp. 443–481, figs. 10*).—Discussing briefly the general morphology of the fig, the author presents the results of a detailed cytological study of staminate and pistillate fig flowers and the development of the micro- and macrogametophytes of the endosperm and of the embryo.

Changes in osmotic pressure of bananas during ripening, F. C. STRATTON and H. VON LOESECKE (*Plant Physiol., 6 (1931), No. 2, pp. 361–365, figs. 2*).—Studies in the research laboratories of the United Fruit Company showed a gradual decrease in order of osmotic pressures from the pulp to the stalk of ripening bananas, indicating a transfer of water from peel to pulp as well as from the stalk through the crown and neck to the peel and pulp.

The Wase mutations of the Satsuma oranges and their temperature requirements, W. T. SWINGLE (*Amer. Jour. Bot., 18 (1931), No. 10, pp. 891, 892*).—Whereas in Japan branch mutations of the Satsuma orange have occurred rather frequently, no such phenomenon has been observed by the U. S. Department of Agriculture in the large plantings in the Gulf States region. Where mutated forms were imported to the United States they grew much as did the parent and not in the dwarf form characteristic of mutations in Japan. However, when grown on the coast of California the Japanese type of growth was noted, making it evident that low spring and summer temperatures are a factor in the production of these aberrant types.

A pink-fruited lemon, A. D. SHAMEL (*Jour. Heredity, 23 (1932), No. 1, pp. 23–27, figs. 3*).—A description is given of an aberrant form of the Eureka

lemon, the fruits of which as they approach maturity develop pink-colored rinds, flesh, and juice.

Morphology and anatomy of the fruit of Hicoria pecan, D. V. SHUHART (*Bot. Gaz., 93 (1932), No. 1, pp. 1–20, figs. 45*).—The results are presented of a study conducted at the University of Chicago upon the flower and fruit of the pecan. Incidentally it was observed that fertilization occurs approximately two weeks after pollination. The endosperm nuclei divide frequently and are arranged peripherally, forming a sac-like structure apparently free of cell walls. The zygote lies at the micropylar end of the embryo sac and remains inactive for several weeks. The fruit of the pecan is described as a kind of a pome.

The book of perennials, A. C. HOTTES (*New York: A. T. De La Mare Co., 1931, [4. ed., rewritten], pp. VIII+272, figs. 112*).—A revised edition of the earlier noted work (E. S. R., 58, p. 239).

Studies in the forcing of gladiolus, T. H. WHITE (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 308–313*).—At the University of Maryland, Michigan-grown gladiolus corms were found much better for winter forcing than were Florida corms of the same varieties. A comparison of dried and undried corms in lots dug October 4 and November 8 failed to show any gain from drying, growth being resumed about the same time in comparable lots. Using corms from plants which had flowered at different dates in the field, no significant differences were recorded in forcing behavior provided the corms had all been subjected to a period of drying in a cool shed. Corms of Halley and F. Pendleton planted on December 12 and given supplementary light in the evening from a 50-w lamp bloomed about a week earlier than controls, and there were fewer blind plants. Among corms of six varieties planted at intervals throughout the year to determine the effect of length of day on blooming, Alice Tiplady was the first to bloom and the only variety to bloom with every planting. Out of doors Alice Tiplady was the fourth in the time of blooming, indicating that day length is a factor in gladiolus forcing and that varieties differ in their response. The possibility of developing short-day varieties is suggested.

Factors influencing the keeping quality of the gladiolus as a cut flower, A. M. S. PRIDHAM and R. G. THOMPSON (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 298–304*).—Gladiolus studies at the New York Cornell Experiment Station showed greater varietal differences in keeping quality than could be induced by any treatment involving time of cutting, coating of the cut end, etc. The submersion of stems to a depth greater than 3 in. did not add to keeping. Gladioli cut in the heat of day kept somewhat better than did those cut in the morning or afternoon, although the moisture content of the spikes cut at 2 p. m. was considerably lower than that of stems cut at 8 a. m. Higher moisture content was found to be directly related to the development of flowers during transportation to market and subsequently. The authors advise that flower spikes should have at least one floret partially open when cut for shipping.

Physiological studies upon Iris germanica.—I, Concerning vegetative reproduction and the influence of internal and external factors [trans. title], S. KRÄMER (*Gartenbauwissenschaft, 6 (1932), No. 3, pp. 243–261, figs. 6*).—This is a discussion of the morphological structure of the iris rhizome, its manner of growth and reproduction, and the effect of certain external factors, such as light, upon growth.

Narcissi culture (*[Gt. Brit.] Min. Agr. and Fisheries Bul. 44 (1932), pp. V+34, pls. 6, figs. 3*).—An English treatise of general nature, but containing a rather full account of bulb treatment for control of eelworm, flies, and mites.

The photoperiodic response of the sweet pea, I. C. HAUT (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 314–318*).—Seed of two early-flowering sweet

peas, Morse Superior Pink and Harmony Lavender, was planted November 15, 1929, in the greenhouse of the University of Maryland, and beginning January 1 the plants were subjected to the following light treatments—7 hours, normal daylight, 15 hours, and 21 hours. Plants in the 15-hour group made the greatest growth, had the darkest color, and blossomed on February 15 as compared with February 12, March 7, and March 9, respectively, for the 21-hour, 7-hour, and regular day lots. The 15-hour lot produced a total of 603 blooms as compared with 294, 46, and 90 for the other lots in the order stated. The length of stem was also superior in the 15-hour lot.

The results of analyses of the stems and leaves of the four lots stated in percentage of fresh weight showed the highest total carbohydrate and highest total nitrogen in the 21-hour lot, closely followed by the 15-hour lot. Apparently the C–N ratio in the 15-hour lot was most favorable to growth and reproduction in the varieties grown. So many of the 7-hour plants had died by April 10 that the balance were given normal daylight to keep them alive.

Germination of bayberry seeds, L. V. Barton (*Contrib. Boyce Thompson Inst., 4 (1932), No. 1, pp. 19–25, fig. 1; abs. in Amer. Jour. Bot., 18 (1931), No. 10, p. 891*).—Stratification of freshly harvested seeds in moist granulated peat for 3 months at 1 or 5° C. was found highly beneficial in stimulating germination of both waxed and cleaned seeds. Germinations of from 50 to 90 per cent were secured in from 18 to 30 days, whereas untreated seed produced no seedlings in 9 months.

Trees and shrubs in northwest Texas, D. L. Jones, F. Gaines, and R. E. Karper (*Texas Sta. Bul. 447 (1932), pp. 63, figs. 26*).—Introduced by brief statements as to adaptation and general cultural requirements, descriptive and performance notes are presented on a large number of trees and shrubs tested at the Lubbock Substation, where the elevation is 3,195 ft. and the average rainfall approximately 20 in., falling mostly during the growing season, April to October. The Chinese elm proved to be one of the best deciduous trees and the Arizona cypress the best evergreen.

Ernest H. Wilson, plant hunter, E. I. Farrington (*Boston: Stratford Co., 1931, pp. XXI+197, figs. 34*).—A biographical sketch illustrated in part with photographs of some of the more valuable plants introduced.

FORESTRY

Light intensity in relation to plant growth in a virgin Norway pine forest, H. L. Shirley (*Jour. Agr. Research [U. S.], 44 (1932), No. 3, pp. 227–244, figs. 7*).—Checking the results of thermopile measurements of the total and diffuse radiation in a virgin Norway pine stand in the Chippewa National Forest, Minn., with natural reproduction, the author found that approximately 35 per cent light, or a crown density of about two-thirds, seemed to offer satisfactory conditions for the establishment of Norway pine seedlings. Light values below 17 per cent resulted in uncertain establishment. The number of trees per acre seemed to increase with light up to the intensity of full daylight.

The optima light intensities for height growth in white, Norway, and jack pines were 36, 63, and 75 per cent, respectively, indicating that Norway pine was less tolerant of shade than was white pine and more tolerant than jack pine. The author believes that light intensities commonly prevailing in virgin stands of Norway pine are not likely to be too low for the establishment of seedlings. Understory growth of hazel and other shrubs, which reduce light to less than 5 per cent, effectively exclude coniferous seedlings and are just

as important in determining reproduction in virgin Norway pine forests as is the density of the forest itself.

The group selection cutting system is deemed the most satisfactory in relation to the establishment of seedlings and their subsequent growth.

Properties of western larch and their relation to uses of the wood, R. P. A. JOHNSON and M. I. BRADNER (*U. S. Dept. Agr., Tech. Bul. 285 (1932), pp. 93, pls. 14, figs. 32*).—Prepared primarily for the purpose of presenting data on the properties and characteristics of western larch to aid the user in determining the suitability of the species for specific uses, this paper presents information on the characteristic properties, grain and texture, mechanical and physical characters, grades and their characteristics, grade descriptions, working stresses for dimension and timber, uses as building material, etc.

DISEASES OF PLANTS

The fungi of Iowa parasitic on plants, J. C. GILMAN and W. A. ARCHER (*Iowa State Col. Jour. Sci., 3 (1929), No. 4, pp. 299–502, figs. 2*).—It is pointed out that Iowa occupies a somewhat central position in the United States, that it is a transitional area both east-to-west and north-to-south, and that this area has been well covered by some of the most prominent collectors of parasitic fungi in the country.

"A count of the listed fungi and diseases shows that there are 938 fungi and diseases on 1,019 host plants. Of these 916 are fungus parasites, while 22 are maladies of nonparasitic origin. Of the parasites 195 are rusts, 61 are smuts, 46 members of the Peronosporales, 26 powdery mildews, 93 species of Septoria, 88 species of Cercospora, 36 species of Phyllosticta, 12 of Cylindrosporium, 24 of Ramularia, 19 of Fusarium, 31 bacteria. The order showing the greatest number of species is the Moniliales with 197, the Uredinales being second with 195. The largest genus is Puccinia with 107 species represented. The distribution of these parasites is shown." In the index to fungi, genera and species are alphabetized. A list of excluded species is given. Hosts are listed alphabetically. The literature list includes 540 titles. The author index and subject index complete the contribution.

Plant pathology, C. W. EDGERTON, E. C. TIMS, P. J. MILLS, L. H. PERSON, and A. G. PLAKIDAS (*Louisiana Stas. [Bien.] Rpt. 1930–31, pp. 105–108, 109–112*).—Progress reports are given of investigations on tomato wilt; mosaic, red rot, pokkah boeng, and root rot of sugarcane; blight and rot of beans; strawberry diseases; Rubus rosette; and dying of Pineapple pear trees.

[Work with fungus pests and their control] (*West Indies Imp. Dept. Agr., Antigua Agr. Dept. Rpt., 1928–29, pp. 10–12*).—This report mentions a case at first suspected to be sugarcane mosaic in B. 417, later pronounced a new sport (not disease), and subsequently found normal as to growth, leaf color, and root system.

A résumé on sugarcane gumming disease prepared by F. S. Ashby outlines the distribution, causation and symptoms, conditions in the island, control measures, and general recommendations.

Sugarcane gumming disease (*Bacterium vascularum*) is said to have been detected in the British West Indies for the first time in St. Kitts, late in 1925. It has since been found in St. Lucia, Antigua, and Dominica, but search failed to find it in Barbados or Trinidad. Outside the British territory it was first reported from Puerto Rico in 1920 and from Colombia in 1926. It was detected in Guadeloupe early in 1929. St. Lucia is said to be the most southerly island in which it has been found.

The bacterium is a wound parasite which is spread rapidly by wind or driving rain, carried in seed pieces from infected stalks, or borne on implements. It is not soil-borne or soil-retained. Though primarily a slight leaf disease, it is liable to travel into the stalks and cause damage proportional to the degree of vascular occupation. All cultivated varieties are susceptible, but in varying degrees as to final injury. Leaves of B. 11569 have been reported as completely infected throughout the island. Other varieties growing in contact with B. 11569 showed slighter leaf infection. The storm of September, 1928, probably caused much of the increased infection. The widely grown variety B. H. 10 (12) is one of the most resistant to gumming disease.

Some fungi recently parasitizing cultivated plants in Argentina [trans. title], J. C. Lindquist (*Rev. Facult. Agron. La Plata, 3. ser., 19 (1930), No. 2, pp. 197–210, figs. 8*).—Brief information as to hosts, characters, and treatments is given regarding *Phyllosticta hedericola* on *Hedera helix*, *P. ligustri* on *Ligustrum vulgare*, *P. mahaleb* on *Prunus mahaleb*, *Phyllosticta perforans* on *Prunus laurocerasus*, *Phyllosticta sophoricola* on *Sophora japonica*, *P. syringae* on *Syringa vulgaris*, *P. syriaca* on *Hibiscus syriacus*, *Phoma domestica* on *Jasminum officinalis*, *Hendersonia togniniana* on *Cycas revoluta*, *Septoria gaillardiae* on *Gaillardia pulchella*, *Entomosporium maculatum* on *Pyrus communis*, and *Pestalozzia fuchsiae* on *Fuchsia coccinea*.

Annual report of work done in the mycological section during the year 1928–29, M. K. Venkata Rao (*Mysore Dept. Agr. Rpt. 1928–29, pp. 18–21*).—Areca koleroga outbreak was not very virulent this year, owing to weather conditions. The alum Bordeaux mixture introduced two years previously as a cheap spray against koleroga proved very satisfactory, appearing likely to replace mixtures previously used. A splitting at the top of areca nut trees is noted, as is also the presence of such fungi as *Marasmius* sp. and *Fomes* sp. The need for a more rapid sprayer nozzle is noted. A search for alternate hosts of the areca koleroga organism showed that a similar disease affected sandal, jak (leaves), Loranthus, *Jatropha curcas*, wild fig, *Colocasia* sp., and *Bryophyllum* sp. Pure culture and cross inoculation work showed areca nut to be affected by isolations from sandal, Jatropha, and Bryophyllum. After crossing the sandal fungus with that from areca, oospores developed in five days. The areca koleroga fungus has the male mycelium, the one on sandal the female mycelial strain. It is thought that oospores may carry over the disease to the next season.

Citrus canker (*Pseudomonas citri*) on lime twigs and fruits was very virulent in some gardens. Some success was obtained by spraying with 1 per cent Bordeaux mixture and with 1 : 25 and 1 : 50 dilutions of 32 B. lime-sulfur.

Betel vine rot affecting chiefly the basal portions and the tips, but showing also as black areas spreading from leaf tips and margins, gave a Colletotrichum and a Rhizoctonia.

Study is indicated in brief detail of the intracellular bodies found in spiked leaves of sandal. A variety of sandal showing spike, brought from Hirehally, a newly spiked area, showed starch accumulation and the presence of intracellular bodies. Pollen grains from flowers of these spiked sandal plants germinated in from 2 to 5 per cent sugar solution. The presence of bodies similar to those found in spiked sandal was ascertained in spiked Stachytarpheta and spiked Dodonaea. Mosaic was observed in tobacco from Whitefield and from Hebbegodu.

Tomato leaf roll was reproduced in healthy plants by inoculation with extract from diseased leaves.

Healthy Datura plants inoculated by means of hypodermic injections and by pin punctures with extract of spiked Datura leaves from Madras failed to develop the infection.

A Heterosporium is noted as supposedly lodging in old millet grains, stored in Mysore, which when converted into flour proved to be poisonous to human beings.

Diseases reported include sugarcane pineapple disease (*Thielaviopsis ethaceticus*) and leaf (ring) spot (*Leptosphaeria sacchari*); onion and garlic, *Macrosporium* sp.; wilts of cotton, eggplants, and plantains, each due to a Fusarium; sandal seedling damping-off (*Pythium* sp.); *Meliola butleri* on lime twigs; and fig leaf rust (*Kuehneola fici*).

An Aspergillus attacking mealybugs in insectaries in southern California, A. M. Boyce and H. S. Fawcett (*Phytopathology, 18 (1928), No. 11, p. 948*).—An Aspergillus is reported as apparently a potential pest in insectaries where mealybugs are propagated for their value in rearing beneficial insects, with notes as to the culture and parasitism of the species.

Plant diseases due to Fusarium vasinfectum [trans. title], F. Sansone (*Ann. R. Ist. Super. Agr. Portici, 3. ser., 3 (1929), pp. 145–163, pl. 1, figs. 3*).—In parts of southern Italy *Aster sinensis*, bean, and other plants show disease associated with the presence of *F. vasinfectum*. The lesion is described in connection with the organism, which appears to be capable also of living saprophytically in the soil.

Some properties of the virus extract of dock mosaic, J. Grainger and G. Cockerham (*Leeds Phil. and Lit. Soc. Proc., 2 (1930), No. 3, pp. 120–124*).—An infectious chlorosis of dock (*Rumex obtusifolius*) is said to have been observed by Grainger in 1928. The present account records experiments conducted in 1929 to determine the nature of the dock chlorosis, which is as a result provisionally considered, on account of the close resemblance to virus diseases, to belong to that general class.

Studies of Texas root rot in Arizona, R. B. Streets (*Phytopathology, 18 (1928), No. 11, pp. 952, 953*).—The greatest economic loss due to any plant disease in Arizona is said to be that from Texas root rot caused by *Phymatotrichum (Ozonium) omnivorum*. During two years the life history of the fungus and control measures have been studied. Efforts employing a large number of media to germinate the conidia have been unsuccessful. The fungus is polymorphic, penetrating the soil by means of rhizomorphs composed of a large central hypha surrounded by a sheath of finer mycelium bearing the characteristic slender cruciform-branched appendages. In cotton or alfalfa the primary infection is usually on the taproot from 6 to 12 in. below the soil surface. In a primary invasion the hyphae may at many points wedge between the cortical cells and enter the adjacent cells. A special technic is needed to isolate the organism and inoculate the healthy plants. One hundred selections from very severely infested fields of Pima and an equal number of Acala cotton have been grown for two years on heavily infested soil, and certain of the surviving progenies show promise of a satisfactory degree of resistance. Chemicals for soil sterilization, including formaldehyde, organic mercury salts, carbon bisulfide, and sulfuric acid, were found practical on small infected spots in which the cost of treatment was not the limiting factor.

Biological studies of Pseudomonas tumefaciens Sm. & Town. and fifteen related non-pathogenic organisms, M. K. Patel (*Iowa State Col. Jour. Sci., 3 (1929), No. 3, pp. 271–298*).—Critical study of 15 nonpathogenic organisms closely resembling *P. tumefaciens* found in the colonies obtained in isolation

trials on overgrowths at the union of piece-root grafted nursery apple trees showed them to be similar to *P. tumefaciens* morphologically as well as in cultural and chemical agglutination reactions. Though slight differences in cultural reactions were noted, these were not sufficiently marked to separate the nonpathogenic organisms from *P. tumefaciens*. Particulars are detailed. Passage of *P. tumefaciens* through tomato plants did not affect the agglutinability of the organisms. Strains of *P. tumefaciens* consistently produced infection on plants of tomato, *Bryophyllum calycinum*, oleander, garden pea, sweet pea, castor bean, and apple. The strains of *Pseudomonas tumefaciens* were separated from the 15 nonpathogenic organisms studied only through their pathogenicity.

Rusts of the Pacific Northwest, J. W. Hotson (*Phytopathology, 18 (1928), No. 11, p. 948*).—The original article is said to constitute a somewhat elaborate key to all the rusts reported from Washington, Oregon, Idaho, and Montana. The rusts of the region are divided according to the host family and then subdivided under the genus of the host. The individual characteristics of the rusts are used to separate those occurring on the same genus.

New preparations for the dry treatment of seeds against rust and other diseases [trans. title], P. N. Davydov (*Udobrenie i Urozhai, No. 7 (1929), pp. 430–433*).—The author points out the advantages of treating seeds with poisonous dusts, of which arsenic is the most commonly used. The insoluble arsenates of iron, copper, or calcium are better than the soluble salts. In order to get the proper mixture, 75 per cent clay and 25 per cent talc are mixed in water, enough of the soluble salt of arsenic is added to make a 25 per cent mixture of sodium acid arsenate, and iron sulfate is added to convert the sodium salt into an iron salt of arsenic. Upon completion of the reaction the mixture is filtered through a filter press and dried. For dusting purposes it is powdered.

Tolerated or toxic dosage with fungicides [trans. title], A. Niethammer (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 40 (1930), No. 1–2, pp. 44–50*).—It is concluded that seeds of the Graminaceae, on account of their characteristic physiochemical structure, react in a peculiar way to fungicidal steeping media and usually are very slightly injured by such chemical contacts. With other seeds and fruits it is likely to be very different, this fact requiring, for these, rather specialized conditions. With each species the toxic or tolerated dosage should be ascertained by means of carefully conducted series of experimentation.

Susceptibility of barley to leaf rust (Puccinia anomala) and to powdery mildew (Erysiphe graminis hordei), E. B. Mains and M. L. Martini (*U. S. Dept. Agr., Tech. Bul. 295 (1932), pp. 34*).—A study is reported on the susceptibility of more than 600 varieties and selections of barley leaf rust and powdery mildew.

It was found that resistance to the various physiological forms of the leaf rust and powdery mildews of barley is rather widely scattered throughout the barley groups. The varieties also differed considerably in their reaction in the greenhouse and in the field.

Some varieties differed radically in their reaction to the two physiologic forms of leaf rust. Varieties also differed considerably in their reaction to powdery mildew, showing differences in type and stability of reaction and marked differences in some cases to the three physiologic forms of mildew studied.

No correlation was found between rust resistance and mildew resistance. Most of the rust-resistant varieties were found susceptible to mildew and vice versa. In some cases the same variety was found to carry resistance to one or more of the physiologic forms of leaf rust and also to one or more of the

physiologic forms of mildew. The varieties Bolivia, C. I. No. 1257, Sulu, C. I. No. 1022, and Welder, C. I. No. 1021, were outstanding for their marked resistance to all the physiologic forms of leaf rust and powdery mildew studied.

Some factors influencing the pathogenicity of Ustilago zeae (Beckm.) Unger, G. A. PLATZ (*Iowa State Col. Jour. Sci., 3 (1929), No. 2, pp. 177-214, pls. 9*).—Surveys of corn smut (*U. zeae*) near Ames, Iowa, in 1923 and 1927 show the disease to have been more prevalent during the latter year, which had a lower mean temperature and lower rainfall. The disease appears to have been favored by the cool dry weather in June, followed by rain and higher temperature. Beginning about July 20 to manifest itself prevalently and successively on leaves, tassels, nodes, and ears, the smut attacked more commonly the axillary buds at the nodes than any other part of the plant. Leaf infection areas show considerable variety. Artificial infection experiments show that corn plants from 1 to 1.5 ft. tall were more susceptible to infection by *U. zeae* than either smaller plants, 0.5 to 10 in. tall, or larger plants, 2 to 4 ft. tall. Supposedly, corn plants about 1 ft. tall expose the growing tip and the delicate young leaves surrounding it to such a degree that they are maximally accessible to the spores.

Greenhouse experimentation showed sweet corn (Golden Bantam) to be more susceptible to *U. zeae* than dent corn (Reid Yellow Dent, strain Iodent No. 25), which was in its turn more susceptible than pop corn (Japanese Hull-less). Inbred strains of dent corn that had not developed smut in the field for several years showed comparatively slighter resistance to infection in the greenhouse when a sporidial suspension was dropped into the terminal leaf-spiral, this method being more successful in producing infection than dusting with chlamydospores or spraying them with a suspension of sporidia. Mutilating the plants before dusting with chlamydospores or spraying them with a suspension of sporidia did not induce infection. Temperatures of 25 to 35° C. favored artificial infection, as apparently also did a high relative humidity. Dropping the sporidial suspension behind the leaf sheaths was not successful in infecting the axillary buds, though young ears were readily infected by dropping the suspension into their distal ends. Artificial infection of corn in the field, during the summer of 1927, by dropping a suspension of sporidia into the terminal leaf-spirals was not very successful.

Inheritance of resistance to blast in oats, W. W. MACKIE (*Phytopathology, 18 (1928), No. 11, p. 948*).—An investigation of blast in oats, causing sterile, blanched, and reduced spikelets and eventuating in heavy crop losses, has not yet yielded a causative organism. Malnutrition does not appear to constitute an adequate cause. Observations during many years, employing over 300 varieties, indicate that varietal resistance is approximately stable. A cross between Kanota, approximately immune, and Richland, susceptible, gave all susceptible plants in the F_1 generation. In the F_2 the plants highly susceptible, moderately susceptible, and practically immune were in the relation, numerically, of 108 : 356 : 178, these numbers showing a close approximation to a 1 : 2 : 1 Mendelian ratio, and indicating a single factor for blast resistance.

An outline of the investigations on the seed- and seedling-rot of rice caused by a watermould, Achlya prolifera Nees, T. HEMMI and T. ABE (*Japan. Jour. Bot., 4 (1928), No. 2, pp. 113-123, pl. 1*).—In Formosa and Hokkaido, rice seeds and young seedlings under water (as is usual) in the nursery beds are often attacked and seriously damaged by a mold. This watermold is said to be referred to usually in the literature (some of which is cited) as *A. prolifera*. The present paper outlines the authors' experimental studies on this organism.

The maximum growth of this fungus, as estimated from the dry weight of the mycelium produced in two weeks, takes place at 16 or 20° C. It grows moderately in the absence of oxygen. The pH range so far as found was from 4.0 to 8.2 (though no tests were made beyond pH 8.2), with optimum from pH 6.2 to 7.2. The growth of the fungus changed the pH of a 1 per cent peptone culture solution from 6.8 to 8.4 in from 15 to 18 days. Though the parasitism of *A. prolifera* to rice seedlings is clearly positive, it appears less destructive than it is usually thought to be in Japan. The medium in which the fungus is growing vigorously shows a tendency to check the growth of the rice seedlings.

Rice diseases (*Louisiana Stas., Rice Sta. Bien. Rpt. 1930–31, pp. 10–12*).—A leaf spot disease of rice, which was noted rather extensively in 1929 and reached alarming proportions in subsequent seasons, is described with suggestions as to possible control by selection of resistant varieties. In cooperation with the U. S. Department of Agriculture, the life history of the stem rot fungus (*Sclerotium oryzae*) and the susceptibility of various rices to infection by the eye-spot fungus (*Helminthosporium oryzae*) and to an undetermined species of Trichoderma were studied as to their nature and the possibility of varietal resistance.

Rye whitehead in Germany [trans. title], H. HÜLSENBERG (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 40 (1930), No. 1–2, pp. 11–25, fig. 1*).—Giving an account of whitehead of rye in central Germany in 1928 and 1929 due to *Leptosphaeria herpotrichoides*, the author particularizes as to the actual agricultural loss, the causative fungus, climatic influence, crop sequence, soils, soil reaction, fertilizers, grain varieties, and the explanation for such disease outbreaks. *Ophiobolus herpotrichus*, the cause of a like disease of wheat, has climatic relations different from those of this fungus.

L. herpotrichoides is conditioned as to its attack by host weakness. All the combined factors, as climate, soil, and cultural methods, which may influence the health of the plant, may aid in starting foot rot and consequently whitehead.

Attack by Pythium on wheat [trans. title], L. PETRI (*Atti R. Accad. Naz. Lincei, 6. ser., Rend. Cl. Sci. Fis., Mat. e Nat., 11 (1930), No. 12, pp. 1066–1068*).—The spring rains in 1930 determined conditions in parts of northern Italy favorable to attack by microorganisms causing wheat foot rot. Study of these showed the presence of some of those usually found in this connection, as *Ophiobolus* sp., *Leptosphaeria herpotrichoides*, *Fusarium culmorum*, or related species. A mycelial growth referable to the genus Pythium was found in association with the stem lesions over a wide area. The characters and relations of this form are discussed.

Wheat smut [trans. title], R. NIEVES (*Rev. Facult. Agron. La Plata, 3. ser., 19 (1930), No. 2, pp. 211–230*).—A systematic account is given of *Tilletia tritici* and *T. laevis* as regards biological characters and genetic constitution and behavior, and bases for the production of wheat varieties resistant to these wheat smuts.

A disease of wheat grains [trans. title], M. CURZI (*Atti Ist. Bot. R. Univ. Pavia, 4. ser., 1 (1929), pp. 151–155, figs. 2*).—Attack by a fungus in the embryonal region of wheat grains is briefly discussed, with a technical description of the causal organism, as a new species, under the name *Acremoniella thermophila*.

The appearance of bean mosaic in England, J. GRAINGER (*Leeds Phil. and Lit. Soc. Proc., 2 (1929), No. 1, p. 32, pl. 1*).—Dwarf kidney bean plants of the variety Monster Negro growing in a plat at Weetwood, Leeds, showed dwarfing of the plant, mottling and puckering of the leaves, and recurving of the leaflets,

with lessening of the crop borne on the diminished plant. The trouble is thought to be identical with that concerned in a report by Fajardo (E. S. R., 65, p. 747).

The influence of sodium chloride in alkali soils on the susceptibility of Pima cotton to angular leaf-spot caused by Phytomonas malvacera, J. G. BROWN (*Phytopathology, 18 (1928), No. 11, p. 951*).—Experimentation since 1921 in the laboratory, screened garden, and field shows that Pima cotton on soil containing from 0.2 to 0.4 per cent sodium chloride is resistant to angular leaf spot (*P. malvacera*). Near the tolerance limit of cotton (0.4 per cent), Pima is practically immune. Sodium carbonate in the soil is not protective, nor is a high osmotic concentration. Resistance may bear a relation to the accumulation of chlorine in the parenchyma. The series is of interest in connection with the growing of cotton on alkali soils.

Cotton wilt, J. F. DASTUR (*India Dept. Agr. Mem., Bot. Ser., 17 (1929), No. 3, pp. [5]+29–73, pls. 6*).—A cotton wilt occurring in the Central Provinces and Berar is described as to its macroscopic, microscopic, and microchemical characters, which are regarded as significant in distinguishing the disease from seedling blight, due to *Rhizoctonia* sp., and in identifying the wilt disease. Wilt-affected plants show the same internal symptoms as do mature healthy plants growing in diseased soil. Fusarium hyphae may be absent in wilt plants, or may be present in healthy plants. Important differences are said to exist, and are detailed, between cotton wilt here considered and the American and Egyptian cotton wilts. Peculiarities of this disease are given in considerable detail.

Leaf blight of Eragrostis major Host. caused by Ophiobolus kusanoi n. sp., the ascigerous stage of a Helminthosporium, Y. NISIKADO (*Japan. Jour. Bot., 4 (1928), No. 1 pp. 99–112, pls. 5*).—Microscopical examination of lesions exhibited in case of a leaf blight of strong-scented love grass (*E. major*) near Kurashiki showed the presence and presumable agency of Helminthosporium. Further investigation showed the fungus to develop also the perfect stage belonging to Ophiobolus. Both types of the spore forms were found. The conidial stage resembles *H. eragrostidis*. The fungus is considered as a new species and the name *O. kusanoi* is proposed.

The brown blight disease of lettuce, I. C. JAGGER (*Phytopathology, 18 (1928), No. 11, pp. 949, 950*).—Brown blight is said to be a new lettuce disease responsible for increasing losses in the Imperial Valley of California. It appeared soon after the beginning of lettuce culture some 12 years previously. Later it was found in other lettuce-growing sections of California and Arizona.

The plants are attacked at all growth stages from that of three or four leaf seedlings to maturity, the plants attacked young becoming yellowish, mottled, stunted, and moribund, though those attacked later showed also conspicuous dead brown streaks and blotches on the leaves. The disease, which is soil borne, may occur in the first crop and increase each year. No degree of control has been obtained with the use of nonsusceptible crops. Though the cause has not been definitely determined, a root parasite is indicated. The association of *Asterocystis radicis* has been rather constant. Highly resistant strains of the New York variety (Iceberg lettuce) have been developed and grown extensively in the Imperial Valley, and among these are mentioned Imperial No. 2, Imperial No. 3, and Imperial No. 6.

Three fusaria which cause the wilt disease of pea, K. TOGASHI (*Japan. Jour. Bot., 4 (1928), No. 2, pp. 153–188, pls. 5, fig. 1*).—The author lists two articles, here called preliminary reports as published in the Japanese language in 1926 and 1928, on an infection of the Alaska pea occurring at the college farm of Kyoto Imperial University. The final decision on the identification

of the fungi found in causal relation with the disorders is credited to H. W. Wollenweber. The present report gives the results of an intensive study, partly comparative, on the cultural characters of these fungi, part of the data being in tabular form.

The results of eight inoculation experiments showed that *Fusarium arthrosporioides*, *F. sporotrichioides*, and *F. anguioides*, isolated from the affected parts of the wilted pea plants, were all parasitic on pea seedlings, *F. arthrosporioides* most severely so, exceeding greatly in this respect *F. martii minus*.

Dust treatments of cut potato seed, E. E. CLAYTON (*New York State Sta. Bul. 610 (1932), pp. 16, figs. 3*).—A study was made of the usual practice of potato growers of cutting, treating, and storing seed potatoes prior to planting.

Some chemicals applied to the cut seed were found to promote decay. In field tests sulfur, and in some cases gypsum, reduced stands and yields where seed was cut, treated, and stored for 3 or 4 weeks. The same treatments had no bad effect, however, on seed cut and stored for a week or 10 days.

One of the best and most practicable dusts used for treatment was found to consist of equal parts by weight of flowers of sulfur and hydrated lime. This dust sifted on the cut seed at the rate of from 6 to 7 oz. per bushel facilitated the formation of a tough protective layer over the cut surfaces. Potatoes *cut and treated from 3 to 4 weeks before planting were benefited by this treatment.* When potatoes were planted within 10 days of cutting, no treatment had an appreciable effect, either good or bad.

Market diseases of fruits and vegetables: Potatoes, G. K. K. LINK and G. B. RAMSEY (*U. S. Dept. Agr., Misc. Pub. 98 (1932), pp. 63, pls. 15*).—Popular descriptions are given of the occurrence, symptoms, and effects of about 40 diseases and injuries of the potato tuber that are met with under market conditions. The diseases are listed in the alphabetical order of the accepted common names, the causal factors are described, and control measures are suggested.

A list of 196 titles of literature cited is given.

On the morphology of Heterodera schachtii, with special reference to the potato-strain, M. J. TRIFFITT (*Jour. Helminthol., 6 (1928), No. 1, pp. 39–50, figs. 9*).—The nematode *H. schachtii*, recognized as a parasite injurious to sugar beet as early as 1881 and since that time recorded as attacking plants in great variety, has been shown to exist in the form of several biological strains. One of these, occurring on potatoes in the Lincolnshire area, has been under observation since 1924 by members of the Institute of Agricultural Parasitology. This form, it is found, has reached a degree of specialization such that the attempts to inoculate it onto plants other than potato have given negative results only.

The author holds that *H. rostochiensis* is not a true species, and that the name should be regarded as a synonym for *H. schachtii*.

The potato nematode [trans. title], E. REINMUTH (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 39 (1929), No. 7, pp. 241–276, figs. 17*).—The author notes, with approval and an account of confirmatory study, the conclusion arrived at by Triffitt (as above noted) that the potato nematode dealt with by the author is, in spite of its strict morphology and the widely used name *Heterodera rostochiensis*, only a highly specialized form of *H. schachtii*.

Sorghum seed treatments with dry soil conditions, H. H. FINNELL ([Oklahoma] *Panhandle Sta., Panhandle Bul. 37 (1932), pp. 7–23*).—The author describes the effects of 6 different dust treatments on 10 varieties of sorghum relating to germination and smut control in 1927, a season in which the initial soil moisture was low. Although a small increase of stand was obtained by seed treatment in the first germination under dry soil conditions, the major

gains resulted from a delayed germination which followed the first heavy rain of the season 26 days after planting.

The largest increases of stand due to seed treatment were made with varieties having less hardy seeds, such as feterita, hegari, Desert Bishop, Pink kafir, and Dawn kafir. The milos showed less need of chemical protection to germinating seeds. Under the seasonal conditions of the experiment the extremely early maturing varieties were found to benefit most in grain yield from the increased stands obtained by seed treatment. Forage yields were increased in all types of varieties where the stands obtained by untreated seed were below normal, but no increase of grain production was noted among late maturing varieties.

The kernel smut of sorghums was controlled by all the treatments tried, and an increased grain production was realized in the cases of highly susceptible varieties even though they matured too late to benefit from stand increases.

Further studies on attenuation of the virus of sugar beet curly-top, E. CARSNER and C. F. LACKEY (*Phytopathology, 18 (1928), No. 11, p. 951*).—In tests mentioned, it was found that under certain conditions, as yet not well defined, the passage of the curly top virus through resistant beets gives a marked attenuation of the virus but varies over a large range. The variation in degree of attenuation apparently corresponds directly to the severity of the symptoms on the infected resistant plant used as the source of the attenuated virus. Such attenuation has been demonstrated for three different strains. So far as studied, neither prolonged development of the attenuated virus in a susceptible plant nor its repeated passage through susceptible plants restores its virulence.

The bacterial-vascular diseases of sugar cane, D. S. NORTH (*Internatl. Soc. Sugar Cane Technol. Cong. [Surabaya] Proc., 3 (1929), pp. 142–146*).—In this paper only a preliminary outline is given of some of the results of recent investigations in Australia on gumming and leaf scald in sugarcane.

Gumming (*Bacterium vascularum*), which is described, is transmitted by spattering or by wind-blown rain, by flies, and by cutting knives. It is conditioned by injuries, one form of which is due to the sharp spines on the leaf edges. A crop may recover under dry weather conditions, or the weakening of the plant may permit further spread and systemic infection, with vascular clogging.

Resistant varieties provide the only practicable means of control. No varieties are known to be sufficiently resistant to withstand repeated intense infection from a neighboring crop of a susceptible variety. But it is held that the disease can be minimized or even eradicated by cropping resistant and excluding susceptible varieties.

Leaf scald (*Bacterium* sp.) has, since 1925, been merely observed, not investigated. Surveys show this disease to be prevalent in the tropical, but only decreasingly so (with some exceptions) in subtropical areas. While it appears to flourish better in wet than in dry climates, the chief factor in determining this distribution appears to be the agency of Badila as a tolerant carrier. Replacement of Badila would be essential to control, but no resistant varieties of equal cropping value are yet available.

Bacterial red-stripe disease of sugar cane in countries of the Pacific, H. A. LEE and W. D. PIERCE (*Phytopathology, 18 (1928), No. 11, p. 945*).—Sugarcane bacterial red stripe, said to have been first recorded in 1924 in the Hawaiian Islands and since to have been reported as at other points, seems to have become rather generally distributed in the Pacific. Its presence on a given area may remain undiscovered until a susceptible variety is grown locally, as most of the standard sugarcane varieties are highly resistant.

Different forms of top rot, P. C. Bolle (*Internatl. Soc. Sugar Cane Technol. Cong.* [*Surabaya*] *Proc.*, *3* (*1929*), *pp. 146–155*).—The author deals chiefly with forms of top rot caused by lightning, by red stripe disease in direct association with *Phytomonas rubrilineans*, and by pokkah boeng. This last, which differs from the other forms in being a dry rot, is described. It was never induced in the characteristic form after a conidial suspension of *Fusarium moniliforme* had been dropped into the leaf spindle.

Gummosis of cane P. O. J. 2878 in Puerto Rico [trans. title], M. T. Cook (*Rev. Agr. Puerto Rico*, *26* (*1930*), *No. 3*, *p. 102*).—The sugarcane variety P. O. J. 2078, which on account of its high sugar production and its resistance to diseases has held a position of preference among cane growers of Puerto Rico, is said to have shown symptoms supposedly of gummosis, which are herein particularized.

Mechanical transmisison of sugar cane mosaic, G. Wilbrink (*Internatl. Soc. Sugar Cane Technol. Cong.* [*Surabaya*] *Proc.*, *3* (*1929*), *pp. 155–161*).—It is concluded after a review of experiences that mechanical transmission may take place by means of the cutting knife, and that this means of transmission may easily be eliminated. It is thought that knife transmission may explain some hitherto imperfectly understood phenomena in mosaic dissemination.

Fungi associated with root rots of sugar cane in the southern United States, R. D. Rands (*Internatl. Soc. Sugar Cane Technol. Cong.* [*Surabaya*] *Proc.*, *3* (*1929*), *pp. 119–131*).—A somewhat detailed summary is presented in this progress report of investigations, chiefly in Louisiana and neighboring States, regarding the factors responsible for sugarcane root rot disease in that section, these studies including the survey of 1924 and the root rot studies in 1927 and 1928.

Extensive isolations from freshly rotted cane roots show Pythium to be the most prevalent genus, 11 well-defined species having been differentiated. Ten of these species, though supposedly abundant in field material, have failed thus far to show infection in pure culture inoculations in steamed soil. These are, therefore, tentatively classed as weakly parasitic or wound infecting types dependent upon the extensive and often severe damage to the roots by animals, some of which are indicated. The eleventh species or group has shown an aggressive parasitism in all inoculation tests. Though apparently less abundant than other groups, the vigorous parasitism, variability, and biologic diversity of this group make this potentially the most important single factor in the root-disease problem. Certain sporulating cultures of this type are said to have been tentatively assigned by Drechsler to *P. arrhenomanes*, the cause of a maize rot in Wisconsin, and this provisional identification has been confirmed by physicochemical studies and reciprocal inoculations on maize and cane with the type culture of this fungus.

Pythium root rot in Hawaii, C. W. Carpenter (*Internatl. Soc. Sugar Cane Technol. Cong.* [*Surabaya*] *Proc.*, *3* (*1929*), *pp. 131–135*).—Though it has been known that *Pythium* sp. bears a causal relation to root rot in Lahaina cane, it has been supposed also that undetermined factors, clearly related to nutrition, leaching, and drainage, exert a controlling influence on the root disease. Accordingly, Pythium rot is being studied with increasing confidence under the hypothesis that root susceptibility is an acquired and temporary condition, and that Lahaina has not undergone essential deterioration, as it is growing normally at one of the stations. The experiments thus far are said to have been rather of a general than of a specific nature.

It is held to have been shown by the accumulation of evidence that predisposition in cane varieties varies in diverse degree in association with nutritional

or absorptive idiosyncrases, as sensitiveness to stimulative organic residues inducing in the roots susceptibility to attack by *P. aphanidermatum*. Other factors supposedly associated and influential in determining the course and progress of the disease are moderate to excessive soil moisture and subnormal temperatures. In Hawaii zoospore formation was decidedly active at 62° F., but not active at temperatures above 70°.

An attempt to cultivate the virus of tobacco mosaic in vitro, J. Grainger (*Leeds Phil. and Lit. Soc. Proc., 2 (1929), No. 1, pp. 33–35*).—The author describes an experiment following the method of Olitsky (E. S. R., 53, p. 547; 57, p. 447) in cultivating the virus of tobacco mosaic in vitro and one employing a chloroplast suspension. Neither of these attempts gave any increase in virus concentration.

On the control of the root knot eelworm, Heterodera radicicola Müll., H. W. Miles and W. H. Turner (*Jour. Helminthol., 6 (1928), No. 2, pp. 59–76, pl. 1, fig. 1*).—Tomato and cucumber root knot, caused by *H. radicicola*, is of widespread occurrence and under such conditions as the presence of fungi may cause serious loss, though under other conditions considerable infestation may show little or no harm.

Trials with calcium cyanide, carried out at various centers in 1926 and 1927, showed substantial reduction of nematode infestation, as measured by the amount of root knot, more than 90 per cent clean plants being produced in some instances. The application of calcium cyanide in solution in autumn was more effective than was that of the dry granular form at the same season. But in the spring, when the soil temperature had risen to 46–48° F., from 96 to 99 per cent of the plants were clean after the application to the soil of the dry form at 1,200 lbs. per acre. The efficiency of this treatment was increased by previously working up the soil thoroughly to promote the break-up of the root galls from the previous season. Plants evidently attacked by the disease should be lifted with a fork at the end of the growing season to avoid leaving the galls in the soil.

It was found that the cyanide did not penetrate far, so that when the cucumber roots grew beyond its range they became badly infested with root knot.

The effect of environment on the nematode of the tomato gall, L. H. Jones (*Jour. Agr. Research [U. S.], 44 (1932), No. 3, pp. 275–285, fig. 1*).—The results are given of a study at the Massachusetts Experiment Station of the effect of environment on the activity of the root knot nematode (*Heterodera radicicola*) of the tomato gall.

All stages in the life cycle of the nematode are to be found in a decaying gall. Among these, the author reports finding a female nematode, which contained a mass of eggs. It was cystlike and corresponded to the brown cyst form of the sugar beet nematode (*H. schachtii*). This particular cystlike form was found only on tomato plants that were growing in a relatively dry soil.

The optimum range of soil temperature for tomato, from 25 to 30° C. (77 to 86° F.), is said also to be the optimum range for nematode activity. A low soil moisture content, 40 per cent, combined with high temperatures, from 24 to 30°, increased the number of galls in proportion to the size of the root system. Plants grown in a soil saturated with water had very few galls, especially when grown at temperatures from 15 to 21°.

The nematodes in detached galls were found to survive for a month or longer in soils ranging in moisture content from 10 to 100 per cent, but not in an air-dry soil. Flooding a gall-infested soil for 28 days did not eradicate the nematode. Galls in an air-dry soil did not protect nematode life as long as 14 days.

Detached galls decay more rapidly than galls attached to a root system. The rate of decay of an attached gall lags about three weeks behind that of a detached gall in a normally moist soil, that is, one containing approximately 60 per cent moisture.

Tomato bacterial canker [trans. title]. W. KOTTE (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 40 (1930), No. 1-2, pp. 51-58, figs. 4*).—In 1927, for the first time, a disease of tomato appeared in Germany manifesting itself by a severe wilting and otherwise corresponding symptomatically to the disease previously designated in America as Grand Rapids disease and afterwards as bacterial canker of tomato. Both outer and inner aspects are indicated. The organism is believed to be identical with *Aplanobacter michiganense*.

The development of tomato yellows under different light conditions, M. SHAPOVALOV and F. S. BEECHER (*Phytopathology, 18 (1928), No. 11, p. 950*).—Tomato yellows (western yellow blight) was reduced by shading, as determined by habitat control experiments, which also related to leafhoppers. Close correlation with evaporation rate, as well as with light, was secured. Low relative humidity favors the disease to some extent. The effect of reducing light was to prolong the incubation period in the host, to accelerate growth, to give the symptoms a milder form, and to lower the percentage of yellows.

Spraying experiments for disease control, 1929, H. W. ANDERSON (*Ill. State Hort. Soc. Trans., 63 (1929), pp. 117-128*).—Spraying and dusting experiments for fruit disease control during 1928 have been noted (E. S. R., 64, p. 449). Those carried out in 1929 included treatments (spray and dust) for control of peach bacterial spot and fungus diseases, spraying apples to control scab, and spraying peaches to control leaf curl. The first series of experiments dealing with peach spraying is presented below. The results of the leaf curl sprayings required that they be repeated.

In the apple scab experiments, conducted at Barry, Ill., under the direction of M. A. Smith, it was found that lime-sulfur used throughout the season gives the best control of scab but that it may cause injury. Flotation sulfur at the rate of 5 lbs. (actual sulfur) to 50 gal. spray material gave satisfactory scab control without noticeable injury to fruit or foliage. Ground wettable sulfur failed to give commercial control. Ferrous sulfate with lime-sulfur increased fruit russeting without decrease of foliage injury. Lime and lead reduced scab insufficiently. Lime alone, even after a prebloom application of lime-sulfur, will not control scab.

Modification proposed of recommendations for the use of flotation sulfur included in case of very susceptible varieties lime-sulfur in the prebloom and the calyx spray. Spraying one, two, and three weeks after petal fall should employ flotation sulfur at 5 lbs. to 50 gal. of water. A variety especially susceptible to lime-sulfur should be given a prebloom spray of lime-sulfur, followed by flotation sprays only thereafter. A variety not especially susceptible to scab except under some seasonal conditions may receive sprays only of flotation sulfur gradually weakened as the season advances. Scab-resistant varieties may receive a prebloom and a calyx spray of flotation sulfur with a follow-up of lead and lime, or of ground sulfurs. Tender varieties, as Golden Delicious, may receive a prebloom spray of flotation sulfur, 5 lbs. to 50 gal., later 3 lbs. to 50 gal. Flotation sulfur with lead arsenate may be used on apples without lime, but for the present it is recommended that lime be added when this sulfur is used on peaches.

"Cephalothecium roseum" Corda, B. DE OLIVEIRA (*Rev. Agron. [Lisbon], 18 (1930), Nos. 3, pp. 49-63, figs. 6; 4, pp. 9-67, pls. 3, figs. 24*).—Of the two parts of the present account regarding *C. roseum* as a cause of plant disease affecting mainly pome fruits, the first deals with its economic significance,

symptoms, causal fungus (*C. roseum*, which is discussed as to its relationships with *Trichothecium roseum*), cultural and biological characters, germinative capability of the spores including their germination, and mycelial development. The second part deals with mycelial development as influenced by temperature, cultural characters at 18° C. on various media, inoculation experiments, and protective applications.

Observations on the discharge of ascospores of Venturia inaequalis in Maryland, R. A. JEHLE and H. A. HUNTER (*Phytopathology, 18 (1928), No. 11, pp. 943–945*).—Formerly, Maryland fruit growers applied the first spray for apple scab control during the pink-bud stage. Failures to control led to studies as to the time of first ascospore discharge. The results are detailed for the four years 1925–1928 as to the appearance of ascospores on the apple varieties examined, including Winesap, Stayman Winesap, Northwestern Greening, Yellow Transparent, Delicious, Ben Davis, and York Imperial.

"In 1927 the first ascospore discharge occurred at widely different stages in the development of the trees in different sections of the State, varying from the so-called prepink stage in the southeast to the calyx stage in the extreme western part. In 1928, in the extreme southeastern part of the State, the first discharge occurred while the trees were still dormant."

Control of peach bacterial spot, J. W. ROBERTS, L. PIERCE, and J. C. DUNEGAN (*Ill. State Hort. Soc. Trans., 63 (1929), pp. 423–430*).—Peach trees in high vigor on fertile soils are much less susceptible to bacterial spot than are those on light sandy soils or in a state of neglect. The first requirement in the control of this disease appears to be a good growing state, conditioned by pruning, cultivation, fertilization when necessary, and freedom from borers.

Attempts made in recent years to develop a spray for control of peach bacterial spot gave results in 1928 which were encouraging, as were also those of 1929. Growers using the newly developed zinc-lime sprays obtained in general satisfactory results, though the sprays failed to control the disease in orchards where a low state of vigor prevailed. The noninjurious character of the zinc-lime sprays was agreed upon. When used with lead arsenate these sprays caused no more injury than did the combination of the common sulfur sprays and lead arsenate. Experimentation carried out near Vincennes, Ind., in cooperation with the Knox County Horticultural Society and the Indiana Experiment Station and in Washington County, Ark., in cooperation with the Arkansas Experiment Station is detailed.

It is concluded that as a means of control of peach bacterial spot the zinc-lime sprays show promise, for the reasons that they checked the development of the spot without injury to any part of the tree and that they can be combined with lead arsenate without greater risk of injury than is usual with sprays containing lead arsenate. They stimulate development in the leaf, possibly also in the fruit. The sprays may prove to lessen from year to year the sources of infection and to increase the resistance of the trees. The ingredients may be cheaply and easily obtained. However, future experimentation is necessary before the sprays are recommended unqualifiedly for bacterial leaf spot control.

Peach spraying experiments for brown rot and bacterial spot control, H. W. ANDERSON and H. H. THORNBERRY (*Ill. State Hort. Soc. Trans., 63 (1929), pp. 129–139*).—The spraying experiments on peach disease control in 1929, carried out in an orchard near Carbondale, were planned primarily to achieve brown rot control, though three plats for treatment of bacterial spot were included. The main purpose was to ascertain the relative fungicidal properties of several commercial brands of sulfur under the conditions, while in the bacterial spot trials various combinations of materials were tested to accomplish

checking or control of the disease. Details of treatments and results are tabulated.

Brown rot infection can not be forecast, though time of spraying is important and a few days of weather favorable to an outbreak may condition an epidemic. The fruit should be protected with sulfur, and a reliable brand of small particle-size should be used. As brown rot spores are very sensitive to sulfur, even very small amounts suffice if the fruit is kept well covered with sulfur in minute particles from July 1 to harvest time.

Bacterial spot is an adverse factor from the appearance of the first leaves until the fruit is harvested. Age of a leaf does not affect its susceptibility to infection, which occurs through the stomata. The bacteria are not usually killed by fungicides, and substances toxic to the disease organisms are toxic to peach leaves and fruits. Rains usually remove the toxic ingredient readily, but inert spray residue may remain visible on the leaf. Comparative accounts are given of treatments tried for bacterial spot. Zinc sprays showed stimulative effects on the varieties Elberta and Hale, with some improvement of appearance. Control of bacterial spot by spraying is regarded as still in the experimental stage.

Cladosporium diseases, L. H. PAMMEL (*Phytopathology, 18 (1928), No. 11, p. 946*).—Papers bearing or reporting on Cladosporium diseases of stone fruits are referred to, the dates ranging from 1889 to 1928.

A strawberry disease caused by Rhizoctonia, S. M. ZELLER (*Oregon Sta. Bul. 295 (1932), pp. 22, figs. 9*).—A study was made of crown and root tissues of strawberry plants grown in the Willamette and Hood River Valleys of Oregon which showed that the only fungus consistently present that was capable of reproducing the disease was a species of Rhizoctonia, which is referred to as *R. solani*.

The symptoms of the disease, as observed in the field and greenhouse, are described, and the factors which influence it are discussed.

Marked differences in susceptibility to the disease are reported for a considerable number of varieties of strawberries that were tested. Some of the host plants of the fungus are enumerated, among them the bracken fern, *Pteridium aquilinum pubescens*, a common native weed in virgin soils, such as are often chosen in strawberry planting.

For the control of the disease, the author suggests the planting of vigorous stock of resistant varieties and the rotation of crops. It is believed that strawberries should not follow strawberries, potatoes, or other crops subject to infection by *R. solani*.

Panama disease of banana [trans. title] (*Agron. Colon., 19 (1930), No. 147, pp. 88–90*).—Panama disease (*Fusarium cubense*), attacking virulently the Gros Michel banana (*Musa sapientum*) at wounds, in particular those made by *Cosmopolites sordidus*, is successfully combated by maintaining uniform humidity and adequate aeration and protecting the plants against the accumulation of carbon dioxide and the presence of the borers.

Squirter disease in bananas: Preliminary report, E. J. GODDARD (*Jour. Council Sci. and Indus. Research* [Aust.], *2 (1929), No. 1, pp. 27–31*).—A disease locally known as squirter has recently caused serious loss to banana interests in Australia, more particularly during the four years preceding this report. The disease shows in bananas produced only in certain areas which are defined. The disease is seasonal, occurring mainly in winter (April-October) and reaching its maximum during the latter half of this period. The very characteristic symptoms are described. It is not possible to detect indications of the disease before the entry of the fruit into the ripening rooms. A connection which has been suggested between squirter and gumming has been definitely

refuted by the investigation. No bacterium or fungus has been connected with the trouble. The rate of ripening does not appear to be significant. Apparently squirter is definitely physiological and regional. Climate may be a factor, as may also shipping conditions. Further investigation appears necessary.

Observations on Tylenchus musicola Cobb, 1919, from diseased banana roots, T. GOODEY (*Jour. Helminthol., 6 (1928), No. 4, pp. 193-198, figs. 5*).—Diseased banana material was examined from banana plants growing in the Royal Botanic Gardens, Kew. These plants had been failing for two or three years and had exhibited symptoms like those described by Nowell (E. S. R., 45 p. 356) as noted in the bluggoe banana in Grenada, British West Indies, in connection with which Cobb, in the same publication, described a nematode claimed to be a new species and named by him *T. musicola*. It was noted more recently by Steiner (E. S. R., 58, p. 755).

From the material in question the present author isolated numbers of *T. musicola* and specimens of one or two other nematodes. His study of *T. musicola* is claimed to confirm in the main Cobb's original description and to throw additional light on certain details not fully made out previously.

Inhibition of enzymatic action as a possible factor in the resistance of plants to disease, L. J. KLOTZ (*Phytopathology, 18 (1928), No. 11, p. 953*).—During an investigation seeking possible bases for the resistance of sour orange (*Citrus aurantium*) and for the susceptibility of lemon (*C. limonia*) to the bark diseases gummosis and decorticosis, due to *Pythiacystis* sp., it was found that the trunk bark of sour orange has a much greater inhibitory or paralyzing influence on the action of certain enzymes found in the dried mycelial powder of the causal fungi than does the trunk bark of lemon. This suggests that the resistance to the pathogenes may be due to the inhibition of one or more of the fungus enzymes by some cellular product of the host, and that a sufficient decrease of this inhibiting influence might permit the hyphae to progress rapidly, as they do in the bark of the susceptible lemon, and successfully paralyze the host. Similar tests with other varieties of Citrus have given results approximating the degree of susceptibility and resistance to *P. gummosis* as indicated by lesions resulting from pure culture inoculations under field conditions.

The die-back disease of citrus trees and its relation to the soils of western India, Part I, G. S. CHEEMA and S. S. BHAT (*Bombay Dept. Agr. Bul. 155 (1928), pp. [3]+48+IV, pls. 12, figs. 20*).—An account is given of the citrus tree die-back in the Bombay Presidency as regards its general features and the damage caused. The course of the disease in the different parts of the tree is detailed. The principal soil types have been studied with reference to die-back, also the conditions favorable or unfavorable to die-back. Supposedly several soil factors, singly or combined, predispose to die-back. Examples of successful treatment of die-back are detailed. Preliminary study of stocks of different genera with a view to controlling the disease is described.

The effect of mixed inoculations of certain citrus fruit-rotting organisms, G. SAVASTANO and H. S. FAWCETT (*Phytopathology, 18 (1928), No. 11, p. 949*).—Inoculations were made in uniform wounds of orange and lemon fruits with mixed spore suspensions from pure cultures of different fungus species, and the effect of these mixtures was compared with that of each fungus inoculated singly. The fungi employed included *Penicillium italicum, P. digitatum, Aspergillus niger, Trichoderma lignorum, Oospora citri-aurantii, Pythiacystis citrophthora, Botrytis cinerea, Sclerotinia libertiana, Alternaria citri, Phomopsis californica, Diplodia natalensis,* and *Dothiorella ribis*. The lots of fruit were maintained at from 8 to 33° C.

Among the important features developed by this investigation were the selective effect of temperature in enabling one organism in a mixture to dominate over the others in producing decay; the depressing or accelerating effect of given mixtures on decay rate as compared with that produced by the most rapidly advancing organism of the mixture when used alone; the influence of given mixtures of organisms on the type of decay, its color, and consistency; and the differences in temperature range, and in optimum, maximum, and minimum temperatures of the various organisms for rate of decay during a given time.

The presence of *O. citri-aurantii* in certain mixtures, especially with *Penicillium digitatum*, caused marked increase in some cases, the rate of decay being greater than the sum of the rates due to the two organisms when used separately.

The mixture of the two species of Penicillium showed a depressing effect at most temperatures except the highest and lowest used. The presence of *B. cinerea* in certain mixtures also showed a depressing effect on rapidity of decay as compared with that of the most rapidly advancing organism of the mixture. Some of the mixtures produced characteristics of color and consistency of decaying tissue that helped to elucidate effects not previously well understood in orchards and packing houses.

A study of citrus blast and some allied organisms, C. O. Smith (*Phytopathology, 18 (1928), No. 11, p. 952*).—It is stated that a great similarity was found as to pathogenicity and cultural characteristics between *Bacterium citriputeale* from avocado and citrus, *B. syringae* from lilac in California, and *B. cerasus* from apricot, the cultural characters agreeing with Bryan's description (E. S. R., 59, p. 247) of the lilac organism. Hosts successfully inoculated by puncture with each and all of the species mentioned included fruit of *Prunus armeniaca*, twigs of *P. armeniaca* (slightly), fruit and twigs of avocado, twigs of *Chalcas exotica* (related to Citrus), twigs and leaves of *Coprosma baueri* (readily), twigs of *Jasminum primulinum* and of *Fraxinus floribunda*, fruit of lemons, twigs of orange (lesions small but typical), fruit of tomato, leaves and twigs of lilac, leaves and twigs of *Populus* sp., fruit and twigs of pears, and fruit and twigs of apple. Reisolations and reinoculations completed the proof. Study indicates thus far that the three species are closely related culturally and pathogenically, and it is suggested that further study may show them to belong to the same species.

Some nutritional aspects in mottle-leaf and other physiological diseases of citrus, A. R. C. Haas (*Hilgardia [California Sta.], 6 (1932), No. 15, pp. 483–559, figs. 35*).—After describing the technic adopted for growing citrus cuttings in cultures, the author reports on the effects of a considerable number of elements and compounds as shown by the character of the leaves.

Zinc in large concentrations was toxic to lemon seedlings, injured the roots, dwarfed the tops, and reduced the size of the leaves, giving a rosette-like appearance to the tops.

Beryllium, like lithium and boron, was extremely toxic in small concentrations to citrus cuttings in water cultures. It caused a mottling of lemon leaves that approached variegation. The toxic effects of the three elements were quite dissimilar. Picric acid in cultures produced another type of mottling.

Urea-containing compounds when in excess in soils caused a yellowing of the leaf tips or a mottling near the leaf apex. Ammonium compounds in excess were toxic, especially when nitrates were low. Portions of leaves produced with a deficient supply of nitrogen and then furnished abundant nitrogen sometimes became dark green while others remained yellow without burning. Excessive concentrations of calcium nitrate were noninjurious in an artificial

soil when good drainage was provided. The extent of injury to citrus trees by sodium nitrate varied according to the concentration and drainage. Large amounts of sodium nitrate were less injurious when the drainage was good. Nitric acid in cultures gave healthy growth.

Leaching loam soil cultures with weak sulfuric or phosphoric acid brought about a gum formation in orange leaves. Chromates in oil cultures were very toxic, but chromium cations added to cultures were not. Continued leaching of a loam soil with a culture solution lacking calcium and saturated with carbon dioxide brought about an abscission of orange leaves, largely as a consequence of a loss of calcium and an abundant supply of potassium.

Chlorotic leaves sprayed with iron-containing solutions showed dark green spots where the solution concentrated and evaporated. Mature chlorotic leaves had the same composition as mottled ones. A close relation was observed between certain cases of mottle leaf and chlorosis.

In the absence of soluble calcium, orange trees in cultures lacking in calcium were more injured when potassium was substituted for calcium than when sodium was substituted. A large absorption of potassium and sodium was observed when calcium was deficient, the absorption of potassium being the greater. A deficiency of soluble calcium was found to exert an effect on the absorption process and hence on the health of citrus trees.

Higher percentages of sodium and potassium and lower percentages of calcium were found in mottled than in healthy trees. The maintenance of a percentage of soluble calcium within a given range was found highly important for the health of citrus.

Experimental reproduction of lemon die-back [trans. title], L. PETRI (*Atti R. Accad. Naz. Lincei, 6. ser., Rend. Cl. Sci. Fis., Mat. e Nat., 11 (1930), No. 2, pp. 146–149*).—Previous statements by the author have been noted (E. S. R., 57, p. 852; 58, pp. 250, 449; 60, p. 831) regarding lemon leaf and twig disorders associated generally with the presence of *Colletotrichum gloeosporioides*. Recent studies are discussed in which he gave attention to a severe lemon die-back seen on the east coast of Sicily, in which the disease consisted essentially in a tracheomycosis correlated with anthracnose of young plants or small branches in association with the presence of *C. gloeosporioides*. It is suggested that anthracnose is produced by another organism. Inoculation tests with *C. gloeosporioides* and other possible causes of die-back and associated conditions are detailed.

Restoration of storm-devastated palm plantations [trans. title], E. F. SAAVEDRA (*Rev. Agr. Puerto Rico, 25 (1930), No. 8, pp. 53, 54, figs. 2*).—To a brief account of recent storm injury to palm groves in Puerto Rico are added outline suggestions as to means and methods for the economical restoration and utilization of the devasted areas.

A considerable factor developed after the storm as a cause of loss was the appearance and spread of bud rot, which affected a large number of palm trees. Suggestions include culture of the surface soil in the maintenance of cover crops of plants indicated in connection with the production of green manure. This is considered as important in connection with the requirements of quick-growing young palms used for replacement.

Phytophthora in relation to crown rot of walnut, J. T. BARRETT (*Phytopathology, 18 (1928), No. 11, pp. 948, 949*).—Observation during five years on walnut crown rot shows that the lesions are at first confined to the crown and to the basal part of the roots of the California black walnut species used as stocks. The southern black walnut (*Juglans californica*) seems more susceptible than the northern species (*J. hindsii*). The white or English walnut root is very resistant. The lesions may, however, extend onto the

English walnut trunk following the girdling of the crown and a weakened condition of the tree, and from such trunk lesions *P. cactorum* has been repeatedly isolated, which, when used to inoculate, has reproduced the disease in both the black and the English species.

The occurrence of Peronospora sparsa Berk. on hot-house roses in southern California, O. A. PLUNKETT (*Phytopathology, 18 (1928), No. 11, p. 950*).—*P. sparsa*, though common and frequently destructive in Europe, has received little attention in the United States. During the early fall of 1927, in connection with cool foggy nights and warm days, the disease appeared in several greenhouses near the coast of southern California. It causes a foliage spot and leaf drop, humid conditions producing abundant conidiophores and conidia in the spots on the undersides of the leaves. The plants are not killed, but the roses are produced too late for the Christmas market. Associated conditions are poor air drainage, excess humidity, and high day with low night temperatures. Control measures are proper ventilation, regulation of humidity and temperature, and frequent spraying with Bordeaux mixture 5-5-50.

Steam sterilization of coniferous seed-beds, T. C. SCHEFFER (*Phytopathology, 18 (1928), No. 11, p. 952*).—Steam sterilization by the inverted pan method of coniferous seed-bed soil has shown decided value. In each of the western conifer genera used, Douglas fir, Sitka spruce, and western yellow pine, in connection with which *Fusarium* sp. and *Phoma* sp. were found, seedling counts made in the fall showed the control plants to be outnumbered from three to four by the plants in the beds steamed in the spring, which also showed better root systems and much lower weeding costs. The 1- and 2-hour steaming periods used were supposedly longer than necessary.

Decay and other losses in Douglas fir in western Oregon and Washington, J. S. BOYCE (*U. S. Dept. Agr., Tech. Bul. 286 (1932), pp. 60, pls. 11, figs. 14*).—The results are given of a study of decay and losses in Douglas fir, one of the most important timber trees of the Pacific Northwest.

After a discussion of losses due to defects caused by felling and other agencies, descriptions are given of the more important rots to which Douglas fir is subject. Much the greatest percentage of damage is reported to be due to red ring rot (*Trametes pini*), followed by brown trunk rot (*Fomes laricis*), red-brown butt rot (*Polyporus schweinitzii*), and yellow-brown top rot (*F. roseus*) in the order named.

Armillaria mellea in mines and wells, J. W. HOTSON (*Phytopathology, 18 (1928), No. 11, p. 948*).—*A. mellea* has been found abundantly in Washington on wooden supports in several coal mines, also on wooden curbings in wells. Although the well cultures directly obtained have not as yet produced sporophores, the form and structure of the rhizomorphs are like those from similar cultures originating from spores of *A. mellea*, supposedly identical.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Laws and regulations relating to game, land fur-bearing animals, and birds in Alaska, 1932–33 (*U. S. Dept. Agr., Bur. Biol. Survey, Alaska Game Comn. Circ. 9 (1932), pp. 36, fig. 1*).—This is the usual compilation of the laws and regulations effective in Alaska, covering the year 1932–33 (E. S. R., 65, p. 151).

The influence of two burrowing rodents, Dipodomys spectabilis spectabilis (kangaroo rat) and Neotoma albigula albigula (pack rat), on desert soils in Arizona, R. A. GREENE and C. REYNARD (*Ecology, 13 (1932), No. 1, pp. 73–80*).—A report is made of analyses of representative soil samples secured

from the dens of kangaroo and wood rats and of similar samples secured from unworked soil in the vicinity of the dens on the Santa Rita Range Reserve in Arizona. In every case the soil from the dens contained a larger quantity of soluble salts, the increases being especially pronounced in the case of calcium, magnesium, bicarbonate, and nitrate ions. The relation of these animals to soil fertility is discussed, and the conclusion arrived at that in the long run the beneficial effects would overshadow the ill effects and that these animals are exerting measurable influences upon the chemical and physical properties of the soil. While the relation of the amount of vegetation consumed by these animals to the increase they cause through increased soil fertility has not been determined, it is considered probable that such consumption of forage is of little economic importance except on overgrazed ranges and in dry seasons.

Possibilities of secondary poisoning of birds and mammals, F. E. Garlough and J. C. Ward (*Science, 75 (1932), No. 1943, pp. 335–337*).—Laboratory experiments conducted by the authors led to the conclusions that (1) arsenic has no great secondary poisoning hazard and is too erratic in its results to be a good rodent poison, and thus is not used in large field control operation; (2) strychnine presents no danger of secondary poisoning to hawks; and (3) thallium appears to be more hazardous, but even this cumulative poison can kill hawks only in extraordinarily large doses unlikely to be obtained under field conditions.

Birds of the seashore, H. J. Massingham (*London: T. Werner Laurie, 1931, pp. 309, figs. 69.*)—This semipopular account, systematically arranged, includes 69 illustrations from pen drawings.

The birds of Oklahoma, M. M. Nice (*Okla. Univ. Biol. Survey Pubs., 3 (1931), No. 1, pp. 224, pl. 1, figs. 12.*)—This is a revision of the work previously noted (E. S. R., 59, p. 549).

Birds of South Carolina.—Supplement: Recent bird notes (*Bul. Charleston Mus., 8 (1912), Nos. 2, pp. 19–26; 3, pp. 27–34*).—These two contributions constitute the first supplement to Wayne's Birds of South Carolina (E. S. R., 24, p. 556).

Second supplement to Arthur T. Wayne's Birds of South Carolina, compiled by A. Sprunt, Jr., and E. B. Chamberlain (*Contrib. Charleston Mus., 6 (1931), pp. IX+37*).—This is the second supplement to the work mentioned above.

[Contributions on game birds and their protection] (*Amer. Game Conf. Trans., 17 (1930), pp. 64–69, 91–126*).—The contributions presented at the seventeenth American Game Conference, held in New York City in December, 1930, include the following: Destruction of Birds by Oil Pollution, by A. H. Hadley (pp. 64–69); The Propagation of Bob-White Quail by Electricity in Maryland, by E. L. LeCompte (pp. 91–100); Artificial Incubation of Pheasants and Other Game Birds, by H. M. Lackie (pp. 101–108); Ruffed Grouse Propagation, by C. O. Handley (pp. 109–112); How to Increase Ducks and Other Game Birds, by G. H. Corsan (pp. 114–118); and The Large Game Situation in North America, by W. B. Bell (pp. 119–126).

More waterfowl by assisting nature (*New York: More Game Birds in America, 1931, pp. 106, figs. 4*).—Among the subjects considered in this contribution are breeding grounds, natural enemies, diseases and parasites, and refuges and concentration areas, and among the several articles appearing in the appendix is a short history of legislative endeavors affecting waterfowl.

Winter food of Oklahoma quail, L. G. and R. D. Bird (*Wilson Bul., 43 (1931), No. 4, pp. 293–305, figs. 2*).—The authors have analyzed the contents of 138 crops from quail in 19 counties well distributed over the State of Okla-

homa, 135 taken in December and 3 in November, 1929, with the following findings:

"Of the total food eaten by bobwhite all over the State, weed seeds composed 50.8 per cent, grain 35.1 per cent, tree and shrub seeds 11.9 per cent, animal matter 1.5 per cent, and the remainder 0.7 per cent. The food of the Arizona scaled quail in Cimarron County consisted of weed seeds 98.1 per cent, animal matter 1.7 per cent, leaves 0.2 per cent. Insects and snails form a low percentage of the food eaten in December. The high percentage of grain consists of waste grain picked up from winter stubble fields. Winter food of the bobwhite in the following sections of Oklahoma consists largely (1) in the Panhandle of kafir corn, sunflower seeds, ragweed, Russian thistle, and thistle seeds; (2) in the southwest of corn, kafir corn, other grain, chittimwood seeds, sunflower, and ground cherry seeds; (3) in the central part of ragweed, sunflower, legumes (especially the trailing wild bean), and wheat; (4) in the northeast of corn, legumes, sumac, and ragweed; (5) in the southeast of legumes, acorns, and ragweed."

The results, in comparison with those of the U. S. D. A. Bureau of Biological Survey, show a higher percentage of grain and of seeds, chiefly weed seeds. There is a much lower percentage of fruit and animal life. These differences are explained mainly by the fact that the Biological Survey average was based upon crops collected during all the months of the year, while the authors' were taken during early winter.

Snakes of the world, R. L. Ditmars (*New York: Macmillan Co., 1931, pp. XI+207, pls. 85*).—This work deals with the subject under the headings of the serpent's world, the scope of the clan, the distribution of snakes, general habits, general classification, the giant serpents, the New World and Old World harmless snakes, the rear-fanged snakes, and the poisonous snakes of North America, Central and South America, Europe and Asia, Africa, and Australia.

Textbook of protozoology, F. Doflein, rev. by E. Reichenow (*Lehrbuch der Protozoenkunde. Jena: Gustav Fischer, 5. ed., rev., 1927–1929, vols. 1–2, I.–II. Hälften, pp. 1262+VIII, figs. 1201*).—The first volume of this fifth edition of the work previously noted (E. S. R., 43, p. 659) deals with the general natural history of the Protozoa. The second volume, which is devoted to the special natural history of the Protozoa, deals with the Mastigophora (pp. 445–722), the Rhizopoda (pp. 723–862), the Sporozoa (pp. 863–1153), the Ciliata (pp. 1157–1212), and the Suctoria (pp. 1212–1218), with bibliographies for each group. Particular attention is given to the parasitic and pathogenic forms.

Tropical rat mites, Liponyssus bacoti Hirst, vectors of endemic typhus, W. E. Dove and B. Shelmire (*Jour. Amer. Med. Assoc., 97 (1931), No. 21, pp. 1506–1511, figs. 5*).—These studies supplement the contribution previously noted (E. S. R., 64, p. 757). Using 4 rats and 10 guinea pigs in the transmission of endemic typhus through bites of *L. bacoti*, positive evidence was obtained of transmission of the disease in 8 instances.

Worm parasites of the brown rat (Mus norvegicus) in the Philippine Islands, with special reference to those forms that may be transmitted to human beings, M. A. Tubangui (*Philippine Jour. Sci., 46 (1931), No. 4, pp. 537–591, figs. 19*).—The author's examination of 950 rats collected in the Philippine Islands resulted in the identification of 16 species of helminths, accounts of which are presented. A list of 63 references to the literature is included.

A comparative histological study of certain nematodes, B. G. Chitwood (*Ztschr. Wiss. Biol., Abt. A, Ztschr. Morph. u. Ökol. Tiere, 23 (1931), No. 1–2, pp. 237–284, figs. 23*).—The nematodes dealt with in this histological and anatomical study are *Oncholaimus pristiurus*, *Rhabdias* sp., *Oesophagostomum dentatum*, *Heterakis gallinae*, *Hystrignathus rigidus*, *H. hystrix*, *Macracis*

monhystera, and *Dorylaimus regius*, representing six families. A list is given of 86 references to the literature.

Alaria mustelae sp. nov., a trematode requiring four hosts, N. J. BOSMA (*Science, 74 (1931), No. 1925, pp. 521, 522*).—The author reports that he has found an undescribed trematode, occurring in the intestines of wild minks and weasels in Michigan, to which the name *A. mustelae* is given. This trematode requires four hosts for the completion of its life history. Sporocysts are found in the snail, producing cercariae, which penetrate into tadpoles or frogs in which they become agamodistoma. These when eaten by a mammal, such as a mink, raccoon, or mouse, become metacercariae in the muscles or lungs. Metacercariae grow to the adult state when eaten by another mammal, such as a mink, weasel, cat, dog, or ferret, in the intestines of which they deposit their eggs. From the latter, miracidia hatch, which are capable of infecting the snail.

[Contributions on economic entomology] (*Louisiana Stas. [Bien.] Rpt. 1930–31, pp. 84–90, 120, 133–138*).—This report of the work of the biennium with economic insects (E. S. R., 63, p. 351) includes notes on artificial control of the sugarcane borer, by W. E. Hinds, [H.] Spencer, B. A. Osterberger, and C. L. Stracener; sugarcane beetle studies and sugarcane rootstock weevils, both by Osterberger; soil animals attacking cane, by Stracener; corn fumigation, by Spencer; a study of Dutox, a new barium fluosilicate insecticidal material, by I. J. Becnel; mite control in the poultry house by the use of "crewood oil," by C. W. Upp; the spotted cucumber beetle, by C. E. Smith, P. K. Harrison, and N. Allen; and bee culture work, in cooperation with the U. S. Department of Agriculture, by W. Whitcomb, jr.

[Contributions on economic insects and their control in Virginia] (*Va. State Hort. Soc. Rpt., 35 (1930), pp. 104–116, figs. 2; 117–133, 134, 135, 135–143*).—The contributions relating to economic insects include the following: The Oriental Peach Moth, by L. R. Cagle (pp. 104–116), Control of the Plum Curculio, by O. I. Snapp (pp. 117–133); Plum Curculio Studies at Crozet in 1930, by W. J. Schoene (pp. 134, 135); and Status of Codling Moth Control in Virginia Orchards, by W. S. Hough (pp. 135–143).

[Contributions on economic insects and their control in the Northwest] (*Better Fruit, 26 (1932), No. 8, pp. 5–7, figs. 5; 8, 9, figs. 2; 10–13, 16–21*).—The contributions here presented include the following: Factors Limiting the Use of Lead Arsenate for Codling Moth Control, by A. Spuler and R. Dorman (pp. 5–7); A Schedule for the Control of the Codling Moth in 1932, by E. J. Newcomer, F. P. Dean, and A. R. Rolfs (pp. 8, 9); Orchard Mites and Their Control, by R. L. Webster (pp. 10, 11); Results of Community Action in Codling Moth and San Jose Scale Control, by W. H. Hicks (pp. 12, 13); Suggestions for Use of Oil Sprays in 1932 (pp. 16, 17); Spray Recommendations for Idaho, 1932 (pp. 18, 19); and The Spray Program for 1932, by I. M. Miller (pp. 20, 21).

The increase of native insects of economic importance in the prairie provinces, N. J. ATKINSON (*Sci. Agr., 12 (1931), No. 4, pp. 200–203*).—A brief discussion of the increase of five of the principal insects which attack field crops in western Canada, all of which are native, namely, the red-backed cutworm, pale western cutworm, wheat stem sawfly, northern prairie grain wireworm, and grasshoppers (the clear-winged grasshopper, *Melanoplus mexicanus mexicanus* Sauss., and the red-legged grasshopper).

[Contributions on economic insects] (*Ent. Soc. Brit. Columbia, Proc., No. 28 (1931), pp. 6–35, fig. 1*).—The contributions on economic insects in British Columbia presented are as follows: Some Notes on the Oyster Shell Scale, by A. D. Heriot (pp. 6–13); *Hemisarcoptes coccisugus* Lignieres, an Enemy of the Oyster Shell Scale, by E. R. Buckell (pp. 14, 15); *Aphelinus mali* Hald., a Para-

site of the Woolly Aphis, by E. P. Venables (pp. 16–18); *Drosophila funebris* as a Host of the Fungus Stigmatomyces, by H. Leech (pp. 19, 20); The Oviposition Habits of *Rhynchocephalus sackeni* Will. (Diptera Nemestrinidae), by G. J. Spencer (pp. 21–24); Holly Insects [*Phytomyza ilicis* Curtis and the black-headed fireworm], by W. Downes (pp. 25–28); The Progress of Parasite Introduction in British Columbia, by R. Glendenning (pp. 29–32); and Notes on the Termites of British Columbia, by G. Beall (pp. 33–35).

[**Contributions on economic insects and insecticides**] (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1930, pp. 71–126, pls. 7, figs. 2*).—The contributions relating to economic insects and insecticides presented in this annual report (E. S. R., 66, p. 347) include the following: Examination of Plants for Insecticidal Principles, II, by F. Tutin (p. 71); Notes on Some Agricultural and Horticultural Pests in the Bristol Province (pp. 72–78), including The Beet Carrion Beetle (*Blitophaga opaca*) and Its Control (pp. 72–74) and A Case of Sainfoin Midge (*Contarinia onobrychidis* Kieff) in Wiltshire (pp. 74, 75), both by L. N. Staniland and C. L. Walton, and Notes on a Serious Tomato Pest (*Scutigerella immaculata*), by C. L. Walton (pp. 76–78); Observations on Capsid Bug Control by Means of "High Neutral" Tar Distillate Washes in 1930, by L. N. Staniland and C. L. Walton (pp. 79–94); The Control of Capsid Bugs [*Lygus pabulinus* and *Plesiocoris rugicollis*] on Black Currants, by L. N. Staniland, F. Tutin, and C. L. Walton (pp. 95–99) (E. S. R., 65, p. 653); The Raspberry and Loganberry Beetle [*Byturus tomentosus*] and Its Control—Further Experiments with Pyrethrum Emulsion Sprays and a Dust, by C. L. Walton (pp. 100–105) (E. S. R., 64, p. 754); A Note on the Control of Woolly Aphis on Dormant Nursery Stock, by L. N. Staniland and C. L. Walton (pp. 106, 107); and The Control of *Galerucella lineola*, a Major Pest of Willows (pp. 108–111) and The Control of *Phyllodecta vitellinae* L. (Chrysomelidae), a Major Pest of Willows (pp. 112–126), both by H. P. Hutchinson and H. G. H. Kearns.

[**Contributions on economic entomology**] (*Ztschr. Angew. Ent., 18 (1931), Nos. 1, pp. 1–206, figs. 66; 2, pp. 219–417, figs. 42; 3, pp. 440–743, pls. 2, figs. 87*).—The contributions here presented (E. S. R., 65, p. 851) are as follows:

No. 1.—Studies of the Biology and Control of the Pine Noctuid [*Panolis flammea*], by E. Meyer (pp. 1–56); Morphological and Physiological Investigations of the Female Reproductive Organs of Lepidoptera—II, Physiological Part, by H. Eidmann (pp. 57–112) (E. S. R., 62, p. 450); Toxicity and Toxic Value of Insecticides—VI, Objectives and Special Methods for Determination of the Toxicity in Individual Experiments, by F. Stellwaag (pp. 113–132); The Susceptibility of Different Varieties of Wheat to Attack by *Chlorops taeniopus* Meig., by O. Watzl (pp. 133–153); Observations on the Flight Habits of the Frit Fly [*Oscinis frit*] and Some Thysanoptera Attacking Cereals, by A. Körting (pp. 154–160); The Webbing Clothes Moth [*Tineola bisselliella*] as a Predator of Living Tick Larvae [*Ornithodoros moubata* and the Fowl Tick], by O. Vollmer (pp. 161–174); Investigations of the Carrot Leaf Psyllids [*Trioza viridula* and *T. nigricornis*], by N. S. Bey (pp. 175–188); A Simple Biocenometer for Determining the Insect Fauna of the Grass Cover, by N. Konakow and Z. Onissimowa (pp. 189–191); A Contribution to the Oviposition of *Theobaldia annulata*, by E. Teubner (pp. 191, 192); Animal and Plant in Symbiosis, by A. Koch (pp. 193–196); *Ephestia elutella* Hb. as an Important Pest of Tobacco (pp. 196, 197); New Investigations of the Spread of the Dutch Elm Disease by Scolytid Beetles (pp. 197, 198); and *Agrotis segetum* Schiff. and Its Control (pp. 199, 200).

No. 2.—The Hemlock Spanworm (*Ellopia fiscellaria* Hb.) and Its Natural Enemies, by K. Schedl (pp. 219–275); Contributions to the Control of Insect Pests through the Internal Treatment of Plants, I, by O. Jancke (pp. 276–318);

Petroleum as a Remedy for Phylloxera: Also a Contribution on the Spreading Capacity of Insecticides, by H. Thiem and L. Kalandadze (pp. 319–343); Investigations of the Toxicity of Dalmatian Insect Powder for the Larvae of *Corethra plumicornis*, by F. Krüger (pp. 344–353); A Contribution to the Epidemiology of *Hylemyia coarctata* Fall., by H. Bremer (pp. 354–360); The Types of Mines of German Bark Breeding Bark Beetles, by H. Prell (pp. 361–370); Contribution to the Chinese Fauna.—IX, On the Biology and Classification of the Ichneumonidae of South China (Fam. Ichneumonidae Hym.), by R. Mell and G. Heinrich (pp. 371–403); and Investigations of the Importance of the Hydrogen-ion Concentration for the Development of Mosquito Larvae, by W. Buchmann (pp. 404–417).

No. 3.—On the Terminology Used in the Science of Variation of Abundance of Organisms, by E. Martini (pp. 440–459); Forest Entomology Investigations in the District of Lunz—I, Local Climate and Microclimate in Their Relation to the Course of Development and to the Mortality of Insects, by E. Schimitschek (pp. 460–491); Observations of the Biology of the Housefly (*Musca domestica* L.) in Palestine, by F. S. Bodenheimer (pp. 492–504); Epidemiological Investigations on *Clysia ambiguella* Hübn. and Their Utilization for Practical Control on a Large Scale, by L. Sprengel (pp. 505–530); On the Science of Insect Pest Control, by W. Zwölfer (pp. 531–536); On the Knowledge of the Periodicity of Insect Epidemics, by H. Eidmann (pp. 537–567); On the Ecology of the Cabbage Butterfly (*Pieris brassicae*), by K. Friederichs (pp. 568–581); The Parasites of the Phalaris Grass Fly (*Majetiola phalaris* Barnes), by H. Blunck (pp. 582–589); The Fate of Beech Trees Infested by the Beech Scale (*Cryptococcus fagi* Bsp.), by L. Rhumbler (pp. 590–614); A Contribution to the Knowledge of the Fauna of the Clear Felled Areas in Pine Forests, by K. Eckstein and V. Butovitsch (pp. 615–633); Experiences with Forest Insects as a Forest Ranger in Saxon Lusatia from 1923 to 1930, by A. von Vietinghoff-Riesch (pp. 634–653); Weevil Studies—III, Results from Brood Chambers, by M. Dingler (pp. 654–671); Two Flies of Importance in Forest Entomology [*Leucopis obscura* Hal. and *Megaselia plurispinulosa* Zett.], by I. Trägardh (pp. 672–690); A Contribution to the Knowledge of Egyptian Bostrychids, by A. Andres (pp. 691–697); Toxicity and Toxic Value of Insecticides—VII, The Fundamentals and Special Methods Employed in Determining Toxic Values in Serial Experiments, by F. Stellwaag (pp. 698–725); and The Use of Baits in Pest Control, by F. Eckstein (pp. 726–743).

[Contributions on economic insects in Italy and its dependencies], G. DEL GUERCIO (*Redia, 19 (1931), pp. [3]+513, pls. 4, figs. 198*).—The contributions presented (E. S. R., 65. p. 546) are as follows: The More Important Scolytid Bark Beetles of the Olive (pp. 1–74); *Phloeothrips oleae* Costa and Its Relations with the Scolytid Bark Beetles of the Olive (pp. 75–195); The Oak Tortrix, Gipsy Moth, and Processionary Caterpillar [*Tortrix viridana* L., *Porthetria dispar*, and *Thaumetopoea processionea*] in the Pieve Forests, Presciana (Arezzo) (pp. 197–211); A New Enemy of the Olive Moth and of the Pear and Almond Tingids (pp. 213–216); The Part of Prospaltella, of Entomococci, and of Insecticides in Protecting the Peach and Other Fruits against Coccids (pp. 217–225); The Black Buprestid of Plum, Peach, Cherry, and Other Fruit Trees (*Capnodis tenebrionis* L.) (pp. 227–252); The Parasite *Aphelinus mali* Hald. Which Controls the Woolly Aphid of Apple and Pear in Italy (pp. 253–307); Observations on the Genus Anuraphis of Del Guercio (pp. 309–501); and The Cottony-Cushion Scale (*Icerya purchasi*) and Its Control by Insecticides (pp. 503–513).

[Contributions on economic entomology in Hokkaido, Japan] (*Hokkaido Agr. Expt. Sta. Rpts. 9 (1919), pp. 76, pls. 7, figs. 6; 12 (1921), pp. [92], pls. 6;*

14 (1924), pp. [125]; 17 (1926), pp. [87], pls. 6, figs. 7; 18 (1927), pp. [48]; 20 (1927), pp. [41–91]; 22 (1928), pp. 56, pls. 2; 23 (1929), pp. 163, pls. 2, figs. 75; 24 (1930), pp. 95, pls. 6, figs. 8; 25 (1930), pp. 181, pls. 5, figs. 27, Eng. abs. pp. 19; 26 (1931), pp. 1–44).—The contributions in these numbers relating to economic insects in Japan, based upon work at the Hokkaido Experiment Station, include the following, all in Japanese: No. 9—Studies on the Japanese Chrysopidae, by H. Okamoto; No. 12—Life Histories of Injurious and Beneficial Insects in Hokkaido, by H. Okamoto; No. 14—[Silkworm Studies], by K. Kobayashi, M. Naito, and S. Baba; No. 17—Biological Studies on the Aphididae of Hokkaido (*Rhopalosiphum avenae* Fab. and *Macrosiphum matsumuracanum* Hori), by M. Hori; No. 18—On the Rearing of the Spring Silkworm, by K. Kobayashi, and On the Qualities of Spring Silkworm Eggs Produced in Hokkaido, by M. Naito; No. 20—On the Hybrid of the Spring Silkworms, by K. Kobayashi; No. 22—On the Treatment of Rice Straw as a Controlling Method of the Paddy Borer (*Chilo simplex* Butler), and The Effect of Carbon Disulphide Fumigation on the Quality of Grain, both by S. Kuwayama; No. 23—Studies on the Noteworthy Species of Plant Lice (Aphididae) in Hokkaido, by M. Hori; No. 24—Notes on the Cottony Apple Scale, *Phenacoccus pergandei* Cockerell, in Hokkaido, by S. Kuwayama and M. Hori; The Woolly Apple Aphis in Hokkaido, with Special Reference to its Controlling Methods, by M. Hori; and Effectiveness of Arsenic Spray for Controlling of the Pea Cutworms (*Barathra brassicae* Linné), by S. Kuwayama and T. Yamaguchi; No. 25—Studies on the Corn Borer (*Pyrausta nubilalis* Hübner) in Japan, and Notes on the Japanese Pyraustinae, both by S. Kuwayama; and No. 26—Experiments on the Preservation of the Silkworm Eggs: First Report (On the Preservation Temperature during Winter), by M. Naito and K. Kobayashi.

The résumé of studies on the European corn borer in Japan contributed by S. Kuwayama in No. 25 is said to be a modification and enlargement of the contribution presented at the Fourth International Congress of Entomology as noted on pages 100–109 of the Transactions (E. S. R., 62, p. 647). The contribution on Japanese Pyraustinae injurious to agricultural and horticultural plants by S. Kuwayama in No. 25 lists 27 economic species with their economic host plants among more than 350 species of this subfamily recorded from that country.

Report of the entomologist, Burma, for the year ending 31st March, 1931, C. C. GHOSH (*Burma [Dept. Agr.], Rpt. Ent. 1930–31, pp. 8*).—A brief report of the work of the year.

[Reports of the work of the entomological section during the years 1928–29 and 1929–30], K. KUNHIKANNAN (*Mysore Dept. Agr. Rpts. 1928–29, pp. 29–36; 1929–30, pp. 25–32*).—The usual annual reports (E. S. R., 62, p. 542).

[Report of entomological work in Punjab, 1929–30] (*Punjab Dept. Agr. Rpt. 1929–30, pts. 1, pp. 53–59; 2, 1, pp. 46*).—In part 1 a brief account is given of the occurrence of and control work with locusts and other important pests of the year. Part 2 is devoted to research, particularly with pests of cotton, including spotted bollworms (*Earias insulana* Boisd. and *E. fabia* Stoll) and their parasites, of which five are noted, the borer *Sphenoptera gossypii* Kerr., and the pink bollworm. Other pests noted include those of sugarcane, particularly *Pyrilla* spp.; pests of rice, particularly the rice stem borer *Schoenobius bipunctifer*; and pests of gram, fodder, fruit, vegetables, etc. Details of antirat work are presented in tabular form. A list is given of locust-eating birds of which the stomach contents were examined, the results of which are presented in tabular form.

Catalogue of Indian insects, XVI–XXII (*Calcutta: Govt., 1928, pts. 16, pp. III+33; 17, pp. II+26; 1930, pts. 18, pp. XXII+389; 19, pp. II+39; 1931, pts. 20, pp. IV+61; 21, pp. III+52; 22, pp. III+15*).—In continuation of the catalogue previously noted (E. S. R., 59, p. 855), the several parts deal, respectively, with Cosmopterygidae and Yponomeutidae, both by T. B. Fletcher; Carabidae, by H. E. Andrewes; Gyrinoidea, by G. Ochs; Alucitidae (Pterophoridae), by T. B. Fletcher; Lycidae, by R. Kleine; and Phaloniadae and Chlidanotidae, by T. B. Fletcher.

Insects in relation to alfalfa-seed production, C. J. SORENSON (*Utah Sta. Circ. 98 (1932), pp. 28, figs. 7*).—This is a report of work conducted for the most part at the Uintah Basin Alfalfa Seed Substation at Fort Duchesne and also each year in western Millard County and in the other seed-producing districts of the State. It was carried on with a view to determining the relationship of certain insects to alfalfa seed production and the development of methods of their control. In addition to the chalcid flies (pp. 6–9), which have been reported upon in Bulletin 218 (E. S. R., 63, p. 656), brief accounts are given of the tarnished plant bug (pp. 9–11), superb plant bug (*Adelphocoris superbus* (Uhler)), thrips (*Frankliniella occidentalis* (Perg.)) (pp. 12–14), aphids (pp. 14–16, blister beetles (*Epicauta sericea* Lec.) (pp. 16, 17), alfalfa weevil (pp. 17–21), grasshoppers (pp. 21–25), and the alfalfa stem nematode (pp. 25, 26).

An introduction to forest entomology, W. J. CHAMBERLIN (*Ann Arbor, Mich.: Edwards Bros., 1931, pp. [5]+138, figs. 8*).—This mimeographed manual of forest entomology deals with the subject in 12 chapters. A subject index and an index to insects and other animals are included.

Insect damage to the timber of teak (Tectona grandis), D. J. ATKINSON (*Burma Forest Bul. 26 (1931), pp. [3]+13, pls. 12*).—An account is given of damage by insects to teak timber, in which eight forms are considered.

Insects attacking stored products, O. W. RICHARDS (*Sci. Prog. [London], 26 (1932), No. 103, pp. 474–485*).—This brief review deals with the subject under the headings of history; definition of stored products; nature of the damage done; the insects concerned, including a tabular list; edaphic factors; specific range in feeding habits; summary of the characteristics of the stored products fauna; migration; control; and the value of stored products research.

Ethylene oxide as a new fumigant for dried fruits, J. E. THOMAS (*Jour. Council Sci. and Indus. Research [Aust.], 4 (1931), No. 1, pp. 53, 54*).—Following a brief reference to the work of Roark and Cotton (E. S. R., 63, p. 153) which led to the introduction of ethylene oxide as an insect fumigant, the author reports briefly upon tests in Australia which have shown it to destroy the egg, larva, and pupa of the Indian-meal moth, known in Australia as the dried fruit moth. Laboratry tests at mean temperatures above 68° F., with a dosage rate of 2 lbs. per 1,000 cu. ft., showed that an exposure period of as low as 4 hours was sufficient to destroy eggs and larvae in experimental packs.

The biological control of insect and plant pests: A report on the organization and progress of the work of Farnham House Laboratory, W. R. THOMPSON ([*Gt. Brit.*] *Empire Marketing Bd.* [*Pub.*] *29 (1930), pp. 124, pls. 8*).—This report on the organization and progress of the work of the Farnham House Laboratory considers the principles and organization of work on biological control (pp. 7–72); Farnham House Laboratory—its resources, buildings, equipment, and staff (pp. 73–81); and the practical work (pp. 81–116), in which parasites of various economic groups of insects, investigations in the West Indies, and insects destructive to noxious plants are considered. A summary of projects submitted to the laboratory (pp. 113–116) and a bibliography of 95 titles (pp. 117–124) are included.

Reactions involved in the use of hydrates in lead arsenate sprays, L. R. Streeter and G. W. Pearce (*Indus. and Engin. Chem., 23 (1931), No. 10, pp. 1140–1144, figs. 3*).—This contribution from the New York State Experiment Station reports that "when acid lead arsenate reacts with small amounts of calcium hydrate to form water-soluble arsenic, the ratio of arsenic to calcium found in solution agrees closely with the ratio of arsenic to calcium in $CaHAsO_4$. Small amounts of magnesium hydrate react with acid lead arsenate to form larger quantities of soluble arsenic than are found when calcium hydrate is used. Calcium and magnesium carbonates react with lead arsenate to form soluble arsenic. Magnesium carbonates produce more soluble arsenic then calcium carbonate. The data presented justify the opinion that hydrates high in calcium content are superior to hydrates high in magnesium content as correctives for spray injury. The reaction between calcium carbonate and lead arsenate is inhibited in the presence of high concentrations of carbon dioxide. Under normal atmospheric conditions the existence of sufficient carbon dioxide to suppress the formation of soluble arsenic seems doubtful."

The Haitian coffee tree cricket, C. H. Arndt and H. L. Dozier (*Jour. Dept. Agr. Puerto Rico, 15 (1931), No. 3, pp. 325–335, figs. 6*).—This is an account of *Chremon repentinus* Rehn., which is a source of injury to cotton and coffee in Haiti due to the entrance of a fungus of the genus Fusarium and occasionally of *Cercospora coffeicola*. These gain entrance through the punctures made in the course of oviposition.

The cockroach Blatella germanica as an intermediate host of Tetrameres americana of poultry, E. B. Cram (*Jour. Parasitol., 18 (1931), No. 1, p. 52*).—The author reports that, in addition to the two grasshoppers previously reported (E. S. R., 65, p. 181), the German cockroach may serve as an intermediate host for the nematode *T. americana* of poultry.

Contribution to the economic study of the Thysanoptera of France [trans. title], E. Pussard-Radulesco (*Rev. Zool. Agr. et Appl., 30 (1931), No. 4, pp. 53–65, figs. 2*).—This is a summary of information on the thrips of economic importance in France.

The larger horned citrus bug (Biprorulus bibax Breddin), W. A. T. Summerville (*Queensland Agr. Jour., 36 (1931), No. 6, pp. 543–588, figs. 27*).—This is an extended account of studies of a citrus-feeding pentatomid bug which, though known in Queensland for more than 40 years, has only in the last 5 years become of particular economic importance. The details of its life history are presented in tabular form.

Feeding punctures of mirids and other plant-sucking insects and their effect on cotton, W. V. King and W. S. Cook (*U. S. Dept. Agr., Tech. Bul. 296 (1932), pp. 12, pls. 3*).—This is a report of experiments commenced in 1927 and carried through three years at Tallulah, La., for the purpose of studying the lesions produced in stems and petioles by the cotton flea hopper and other plant-sucking insects. The work was conducted with a view to determining whether the injury to cotton following the feeding of these insects was the result of a transmissible virus or due to mechanical or chemical injury. Individuals of 10 species (7 Hemiptera and 3 Homoptera) were tested, the average severity of the damage being found to vary with the species.

Of the two more important field pests, the percentage of split lesions was 32.6 for the tarnished plant bug and 9.5 for the cotton flea hopper. About 7 per cent of the lesions caused by the cotton flea hopper and 10 per cent of those caused by the tarnished plant bug did not show externally. *Poeciloscytus basilis* Reut., a species which is seldom taken on cotton, caused external swellings at every feeding point and produced the highest percentage of split lesions

(58.2) of any of the species tested. Of all the individuals that fed more than once only two failed to produce the injury at some feeding point.

The experiments with these species have shown that nearly all individuals cause a reaction in the tissues of cotton stems and leaf petioles similar to that produced by the cotton flea hopper. This is taken to indicate that hopper damage is due to injected substances normally present in the insects and toxic to the plant, rather than to a transmissible disease.

Observations on the bean lace-bug in Porto Rico, M. D. LEONARD and A. S. MILLS (*Jour. Dept. Agr. Puerto Rico, 15 (1931), No. 3, pp. 309–323, pls. 2, fig. 1*).—This contribution from the Puerto Rico Insular Experiment Station is a summary of information on *Corythucha gossypii*, which occurs commonly in the West Indies and the Central American countries and appears to be far more injurious to Lima beans than to any other of its known food plants. The authors have obtained 100 per cent kill of the nymphs and 96 per cent of the adults by using Octagon soap at the rate of 1 lb. in 8 gal. of water.

A list is given of 44 references to the literature.

Control of prickly-pear by the cochineal insect, T. V. RAMAKRISHNA AYYER (*Nature [London], 128 (1931), No. 3237, p. 837*).—This contribution from Madras, south India, calls attention to the fact that by its steady and effective work the cochineal insect is satisfactorily clearing cactus (*Opuntia dillenii*) from the countryside.

On the biology of Chrysomphalus ficus Ril. (Hem., Cocc.), with suggestions on the control of this species in Egypt, H. PRIESNER (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 117 (1931), pp. 19*).—This account, which deals chiefly with the life history of the most important citrus scale insect in Egypt, the Florida red scale, includes a list of host plants, systematically arranged, a brief discussion of damage and injury, and natural and artificial restrictions, and suggestions for control. Brief reference is made to the recent contributions on the biology of this scale by Balachowsky (E. S. R., 62, p. 544) and M. Matsuda.[1]

Demons of the dust: A study in insect behavior, W. M. WHEELER (*New York: W. W. Norton & Co., 1930, pp. XVIII+378, pl. 1, figs. 49*).—In this work particular attention is given to the biology of the Myrmeleonidae, or ant lions, and worm lions of the genera Vermileo and Lampromyia of the dipterous family Rhagionidae, or Leptidae. Translations of C. De Geer's Report on the Worm-Lion (pp. 299–314) and R. A. F. de Réaumur's History of the Worm-Lion Fly (pp. 315–334) appear in appendixes, and a bibliography of 20 pages is included.

An oecophorid moth, Borkausenia pseudospretella Stainton, attacking book bindings, R. N. CHRYSTAL (*Ent. Mo. Mag., 3. ser., 18 (1932), No. 205, pp. 9, 10, pl. 1*).—Damage done to books in an underground bookstore at Oxford, England, mainly confined to the bindings, on the surface of which irregular patches of varying depth had been excavated, was found to have been caused by the caterpillars of *B. pseudospretella*. About 40 per cent of the books were attacked, and in about 15 per cent of these a considerable amount of damage had been done to the bindings.

Summer treatments for the control of the eye-spotted budmoth, S. W. HARMAN (*New York State Sta. Bul. 609 (1932), pp. 16, figs. 8*).—The present bulletin reports upon four years of experimental control work with the larvae and adults of the eye-spotted budmoth by midsummer treatments, a report of control work with hibernating caterpillars having been noted (E. S. R., 66, p.

[1] Studies on *Chrysomphalus aonidum* L. in Formosa [trans. title]. Formosa [Taiwan] Govt. Research Inst., Dept. Agr. Rpt. 39 (1929), pp. [3]+3+79, pls. 6, figs. 56.

555). The moths of this pest are active from late June to the latter part of August, the new generation of caterpillars appearing during July and August. Of the measures tested, sprays containing lead arsenate applied when the young larvae appeared were the most promising. Sprays of nicotine sulfate were also effective against the young caterpillars. Moths were killed in large numbers with nicotine dusts and also by attraction to bait and light traps. The practical value of these methods to reduce the moth population, however, was not determined.

The primary larvae of three ophionine ichneumonids, parasitic on Rhyacionia buoliana, W. H. THORPE (*Parasitology, 24 (1932), No. 1, pp. 107–110, pl. 1*).—This contribution, which supplements the earlier account (E. S. R., 64, p. 362), deals with the primary larvae of *Cremastus interruptor* Grav., *Eulimneria rufifemur* Thoms., and *Omorgus mutabilis* Holmg., parasitic on the European pine shoot moth.

Preliminary observations on two species of Beauveria attacking the corn borer, Pyrausta nubilalis Hübner, C. L. LEFEBVRE (*Phytopathology, 21 (1931), No. 12, pp. 1115–1128, figs. 4*).—Studies of *B. bassiana* and *B. globulifera* have shown the former to be a much more virulent pathogene on the European corn borer than is *B. globulifera*. As far as is known, *B. bassiana* has never been reported to occur on the corn borer in the United States, but has been collected once in this country.

Codling moth life history studies in southwestern Idaho, C. WAKELAND and P. L. RICE (*Idaho Sta. Research Bul. 10 (1932), pp. [2]+56, figs. 32*).—This is a detailed report of biological studies of the codling moth in southwestern Idaho, commenced in 1924 and continued through 1928, and presented in large part in tabular and chart form.

The study revealed a marked variation in activity from year to year caused by variable climatic conditions. These are sufficient to necessitate basing the yearly control program on information obtained during the current season in addition to having a general knowledge of the life history of the insect.

"The majority of codling moth individuals pass through two generations a year in southwestern Idaho, but there are interesting variations from the usual occurrence. A small proportion has but one generation a year, which is shown by the fact that 1.85 per cent of the larvae of the first generation in 1926 and 1.5 per cent of the larvae of the first generation in 1927 did not pupate until the following spring. The proportion of the second generation which annually develops into a third generation varies with seasonal conditions. In 1926 and 1927, 63.17 per cent and 13.91 per cent, respectively, of the larvae of the second generation transformed to moths which were the progenitors of third-brood larvae. Third-brood larvae rarely mature before harvest but they cause many tiny worm holes late in the season. One third-brood moth only developed in the course of these studies, but this single instance indicates that during certain years there may be deposited a few fourth-brood eggs.

"Seasonal variations in codling moth activity are apparent when dates of certain events in the life cycle for different years are compared. Spring-brood moths emerged 16 days earlier in 1926 than in 1927 and 10 days earlier than in 1928. The first eggs of the first brood were deposited 20 days earlier in 1926 than in 1927 and 13 days earlier than in 1928. First-brood larvae entered the fruit 21 days earlier in 1926 than in 1927 and 7 days earlier than in 1928. First-brood moths emerged 13 days earlier in 1926 than in 1925 and 18 days earlier than in 1927. Egg deposition of the second brood began 8 days earlier in 1926 than in 1925 and 15 days earlier than in 1927. The height of egg deposition for second-brood moths occurred 24 days earlier in 1926 than in 1925 and 17 days earlier than in 1927. Trap records obtained in 1929, after

the completion of the studies, indicated that the height of egg deposition for the second brood occurred approximately August 20, or 32 days later than in 1926. Second-brood larvae began entering the apples 9 days earlier in 1926 than in 1925 and 16 days earlier than in 1927. Second-brood moths appeared 27 days earlier in 1926 than in 1925 and 18 days earlier than in 1927. Eggs of the third brood began to be deposited 16 days earlier in 1926 than in 1927 and 28 days earlier than in 1925."

Codling moth control: Experiments at Harcourt, R. T. M. PESCOTT (*Jour. Dept. Agr. Victoria, 29 (1931), No. 11, pp. 538–543, figs. 5*).—Experimental work at Harcourt is said to have again shown that satisfactory control of the codling moth can not be obtained through the use of arsenate of lead alone (E. S. R., 64, p. 246). Such control was obtained, however, where a white oil emulsion was used as an ovicidal spray following the preliminary arsenical calyx sprays, and the use of these oil sprays was shown to be economically sound.

Daytime resting places of Anopheles mosquitoes in the Philippines (first report), P. F. RUSSELL (*Philippine Jour. Sci., 46 (1931), No. 4, pp. 639–649, pls. 4*).—A brief review of the problem of catching anopheline breeding mosquitoes in the daytime in the Philippines is given, together with some observations as to the situation in the Philippines. It appears that routine daytime catches of Anopheles imagoes in the Philippines will have to include not only human habitations or animal houses but primarily natural shelters such as cracks, crevices, and caves near or in the ground, not necessarily near breeding places. A list of 26 references to the literature is included.

Ox warble fly: Report on the demonstrations and experiments, 1928–31, R. C. GAUT (*Worcester: Worcestershire Co. Council, Dept. Agr. Ed., 1931, pp. 32, fig. 1*).—This report reviews the demonstrations and experiments of the years 1928 and 1929 and 1930, previously reported (E. S. R., 64, p. 547), and in addition reports upon the work of 1931.

The beet fly Pegomyia hyoscyami Pz., H. BREMER and O. KAUFMANN (*Die Rübenfliege Pegomyia hyoscyami Pz. Berlin: Julius Springer, 1931, pp. V+110, figs. 32*).—This monographic account is based upon studies of the so-called beet fly, officially known as the spinach leaf miner, in the beet-growing districts of Pomerania and Silesia, and a review of the literature, a list of 188 references to which is included. Part 1 (pp. 1–30) takes up its classification and morphology, part 2 (pp. 31–54) its life history, part 3 (pp. 54–67) its parasites and predatory enemies, part 4 (pp. 67–88) the epidemiology of outbreaks, and part 5 (pp. 88–104) control measures.

A scavenger fly, Chrysomyza demandata Fabr., breeding in corn silage (Dipt.: Ortalidae), C. J. DRAKE and G. C. DECKER (*Ent. News, 43 (1932), No. 2, pp. 29, 30, pl. 1*).—This contribution from the Iowa Experiment Station records the finding of the European scavenger fly *C. demandata* breeding in large numbers in corn silage near Valley Junction, Iowa, in April, 1931. This pest was first recorded in the United States in 1900. The infested silage is said to have been relished by cattle, which have consumed thousands of maggots without any apparent ill effects.

Experiments with a new fruit fly lure, H. JARVIS (*Queensland Agr. Jour., 36 (1931), No. 5, pp. 485–491*).—This is a report of investigations of fruit fly lures, in which the details are presented in tabular form.

In tests of the olfactory reaction of fruit flies to various oils and vegetable essences which were made by the author during the last 5 years with varying success, it was found that the Queensland fruit fly (*Chaetodacus tryoni* Frogg.), the most destructive species in Queensland, was indifferent to all of the odors that were so attractive to other flies elsewhere. The lure formulated by the author in 1928, consisting of a combination of imitation vanilla extract (½

oz.), ammonia (½ oz.), and water (26 oz.), was found to be particularly attractive to the Queensland fruit fly and to the Mediterranean fruit fly, the latter in New South Wales, where it was tried out during the season 1928–29 by F. Chilton, of Sydney. A comparison made of the Jarvis lure with the only other lure on the market led to the conclusion that it is equally as attractive to both sexes of the Queensland fruit fly. During the season of 1929–30 the lure was used by many orchardists in the Stanthorpe district and also in the Toowoomba district.

Further observations on Tylenchinema oscinellae Goodey, 1930, a nematode parasite of the frit-fly, T. GOODEY (*Jour. Helminthol., 9 (1931), No. 3, pp. 157–174, figs. 2*).—This further account (E. S. R., 65, p. 360) includes a report of observations made in 1930 of the occurrence of the nematode and the degree of infestation in both male and female frit fly of the overwintering generation, the larvae of which attack wild grasses or winter cereals.

Insect injury of blue grass in relation to the environment, L. F. GRABER, C. L. FLUKE, and S. T. DEXTER (*Ecology, 12 (1931), No. 3, pp. 547–566, figs. 10*).—In studies at the Wisconsin Experiment Station (E. S. R., 65, p. 452), the authors found the injury to bluegrass resulting from the consumption of subterranean growth by white grubs (*Phyllophaga* spp.) to be greatly intensified by all unfavorable conditions of the external and internal environments of the plant. "This situation was indicated by field surveys in which the relative extent of the injury to pastures from white grubs had been correlated with deficiencies in fertility of the soil, in the organic food reserves of the plants, in moisture, and in combinations of such general factors influencing growth. To gain more specific evidence, however, such conditions of the field were reproduced in cultures by definite fertilization and cutting treatments, and by regulation of the moisture supply. The introduction and maintenance of approximately equal numbers of white grubs in a part of such cultures, and the utilization of the remainder as controls, made possible a study of the relation which the external and internal environments bear to the degree of grub injury sustained by bluegrass. This was measured, in part, by observational estimates based on plant populations and comparative rates of growth of infested and control cultures of bluegrass grown under a wide range of environmental conditions. These results were corroborated by quantitative determinations of top growth in which the percentages of loss in productivity due to grub injury were ascertained from specific yields of the grub-infested cultures and the controls.

"With bluegrass grown under conditions of optimum moisture, such reductions in productivity varied from 7 to 23 per cent when cultures of this grass had been cut to maintain an abundance of organic foods, and from 53 to 77 per cent when such foods were less abundant. Likewise, the white grubs reduced the yields of top growth of bluegrass grown with deficient moisture from 33 to 37 per cent when the grass was in a state of high reserves, and from 70 to 88 per cent when the reserves were low. Liberal fertilization tended to reduce the injury in all cases except where accumulations of leaf growth inhibited the subterranean development and the regenerative capacity of the grass to a marked degree. Thus it appears evident that the injury from white grubs is lessened when conditions favor the quantitative development of subterranean growth of bluegrass, and especially when such factors of the environment augment the regenerative activity of the grass during the feeding period of the insect. That the environment of the plant is significant in relation to insect injury is made manifest."

Populations of white grubs in pastures with relation to the environment, C. L. FLUKE, L. F. GRABER, and K. KOCH (*Ecology, 13 (1932), No. 1, pp. 43–50,*

figs. 5).—Continuing the work noted above, population counts of white grubs in permanent bluegrass pastures show that thick or very dense sods resulting from judicious grazing practices, ample fertility, and favorable moisture conditions are relatively free from grub infestations. It appears that either the beetles have selective egg-laying habits, choosing the thinner sods of grass weakened by an unfavorable environment, or with indiscriminate laying the eggs may fail to hatch or develop larvae capable of penetrating thick dense sods. Grubs were found to be much less numerous in thick stands of sweetclover established in permanent bluegrass pastures than in adjoining pastures of bluegrass growing alone. It is concluded that such differences in grub densities are accounted for by an adult avoidance of sweetclover as a crop medium for egg laying, since it is assumed that if the eggs were laid in such places they would hatch and the grubs develop.

Experiment in control measures against damage in nurseries by the brown chafer (Serica brunnea), M. L. Anderson (*Scot. Forestry Jour., 45 (1931), pt. 2, pp. 149–154*).—A very widespread damage to coniferous stock in forest nurseries in Scotland in the summer of 1929 by *S. brunnea* led to a study of control measures. The use of trichlorethylene, which appears to be immediately effective, is said to have given the best results. Used at the rate of 12 5-g injections per square yard, 15 lbs. of liquid is enough for 100 sq. yds. of seed bed.

A contribution to the embryological development of Euryope terminalis Baly (Coleoptera, Phytophaga, Chrysomelidae).—Part I, The early embryological development, N. F. Paterson (*So. African Jour. Sci., 28 (1931), pp. 344–371, pls. 5, figs. 6*).—Part 1 of the contribution which is here presented consists of an account of the early development of the chrysomelid beetle *E. terminalis* from the time of oviposition to the beginning of the segmentation of the embryo. A list of 27 references to the literature is included.

The leek leaf beetle in south Manchuria: Life history [trans. title], H. Y. Arakawa (*Research Bul. Agr. Expt. Sta. So. Manchuria Ry. Co., No. 5 (1931), pp. 41–50, pls. 2; Eng. abs., pp. 49, 50*).—This is an account of the biology of the leak leaf beetle (*Galeruca bang-hassi*), a native of China, which is distributed from Japan (in the vicinity of Tokyo) to south Manchuria. The native food plants include leek, onion, garlic, and young leaves of other vegetables.

The Phoracantha beetle, F. G. C. Tooke (*Farming in So. Africa, 6 (1932), No. 70, pp. 417, 418, 430, figs. 2*).—This is an account of *P. semipunctata* which, with the eucalyptus snout beetle (*Gonipterus scutellatus*), has succeeded in gaining entrance to and becoming established in eucalyptus tree plantations in South Africa.

The gray-striped weevil Sitona lineata L., K. T. Andersen (*Der Linierte Graurüssler oder Blattrandkäfer Sitona lineata L. Berlin: Julius Springer, 1931, pp. VII+88, figs. 40*).—This monographic account is based upon a study of *S. lineata* begun in 1927 and a review of the literature, a six-page list of references to which is included. This enemy of peas, beans, and other legumes occurs throughout Europe but is of particular importance in the southern part of the Continent. It is not known to be of economic importance elsewhere.

The pear flower bud weevil in south Manchuria, Anthonomus pomorum L. [trans. title], H. Y. Arakawa (*Research Bul. Agr. Expt. Sta. So. Manchuria Ry. Co., No. 5 (1931), pp. 13–39, pls. 11; Eng. abs., pp. 37–39*).—This is an account of studies, particularly of the biology, of *A. pomorum*, which is an important enemy of the pear in Tokuriji, south Manchuria, losses of from 20 to 70 per cent of the crop having occurred in badly infested localities.

Is the honeybee responsible for the spread of fireblight germs? I, II, H. R. Rosen (*Amer. Bee Jour., 71 (1931), Nos. 6, pp. 270–272, figs. 2; 7, pp. 320, 321, figs. 2*).—The first part of this contribution from the Arkansas Experiment Station reports upon current ideas concerning the initiation and spread of fire blight. The second part reports upon work in the course of which the author was able to isolate and obtain pure cultures of the fire blight organism from samples taken within the hives through the year, including the early spring before the bees became active outside of the hive and before any blight developed. The germ was also isolated from the new brood of bees in the early spring. See also a previous note (E. S. R., 64, p. 250).

Controlling the firebrat in buildings by means of poisoned bait, C. Wakeland and H. Waters (*Idaho Sta. Bul. 185 (1931), pp. 15, figs. 5*).—This is an account of the firebrat, a pest closely related to the silverfish, which was first discovered in 1929 to have become established in many of the buildings and heated tunnels at the University, by which time it had caused noticeable injury to paper products and valuable records. They destroy book bindings, manuscripts, and various paper products, and may become the source of great loss and annoyance.

The studies were conducted with a view first to determining their food preference and second to finding an effective poison that when mixed with the preferred food would make an efficient poisoned bait. The observations indicate that they do not feed on paper products if they have ready access to food substances they like better, and that they select vegetable foods high in carbohydrate content. The pest was found to prefer moist wheat flour to all other foods tested. It was determined to be more practical to use a dry food than a moist food in a bait which is to be attractive over long periods of time. Oatmeal proving to be the preferred dry food was used as a basis for poisoned bait, its attractiveness being further increased by adding sugar and salt. White arsenic was found to be an effective poison for the firebrat, having no repellent action when added to its preferred food.

It is recommended that a poisoned bait for use in the control of this pest be composed of oatmeal (finely cut or ground) 100 parts by weight, white arsenic 8 parts, granulated sugar 5 parts, salt 2.5 parts, and water to make slightly moist. Mix together dry the oatmeal, white arsenic, sugar, and salt. Moisten the mass and mix thoroughly to bind the substances together. Then thoroughly dry the bait to prevent mold, and crush it up into small bits so it may be scattered lightly. Scatter the poisoned bait lightly behind bookcases, radiators, on shelves, etc., or in any places frequented by firebrats.

A study of the ticks in Kenya Colony: The influence of natural conditions and other factors on their distribution and the incidence of tick-borne diseases, Part I, E. A. Lewis (*Kenya Colony Dept. Agr. Bul. 17 (1931), pp. [1]+19, fig. 1*).—This part consists of a report on an investigation into the tick problem in the Rift Valley, Kenya Colony.

Notes on the tick Ornithodoros talaje (Guer.) infesting a house in the Canal Zone, L. H. Dunn (*Psyche, 38 (1931), No. 4, pp. 170–174*).—An account is given of the infestation of a house at Gatun, Canal Zone, by this tick, which was the cause of considerable annoyance.

ANIMAL PRODUCTION

[Feeding and nutrition studies with livestock] (*Louisiana Stas. [Bien.] Rpt. 1930–31, pp. 54–67, 115–119*).—This report includes the results of studies with beef cattle, swine, mules, sheep, and poultry.

The cattle studies include creep-feeding of beef calves, Brahman v. beef-type sires, pasture for beef production, summer fattening of steers on pasture comparing grain on grass with grass alone, all by C. I. Bray; and blackstrap molasses and corn-soybean silage for fattening yearling steers, the effect of the addition of varying amounts of blackstrap molasses upon the digestibility of the various nutrients, and the digestibility of artificially dried soybean hay as compared to sun dried soybean hay, all by M. G. Snell. Data on feeding value and the extent to which blackstrap molasses could replace corn for work mules were also reported by Snell.

As swine studies are reported data on hogging down corn v. dry-lot feeding, sweetpotatoes for fattening swine, shrimp bran, cottonseed meal, and tankage as protein supplements for swine, and the value of pasture crops, cod-liver oil, and ultra-violet light, all by Bray.

The sheep work included data on growth in spring lamb production, the effect of plane of nutrition upon wool production and reproduction of ewes, and a partial survey of wool production in Louisiana, all by Snell.

The work reported with poultry included studies on the storage of Louisiana eggs, rice by-products for laying hens and for growing chicks, effect of heavy laying on hatching results, shrimp meal as a protein supplement for hens, simple v. complex rations for laying hens, and keeping chickens in confinement, all by C. W. Upp.

The effect of yeast and casein supplements to corn and soybean rations when fed to rats and swine, C. L. Shrewsbury, C. M. Vestal, and S. M. Hauge (*Jour. Agr. Research [U. S.], 44 (1932), No. 3, pp. 267–274, figs. 2*).—Continuing these studies at the Indiana Experiment Station (E. S. R., 65, p. 158), groups of rats and swine were fed a basal ration composed of yellow corn, soybeans, and a salt mixture 84 : 14 : 2. Two males and two females constituted a test group of rats, and each ration was tested on at least three groups. The pigs were divided into lots of 10 head each and fed in dry lot. The length of the experimental period was 10 weeks. The experimental rations differed from the basal ration by the substitution for a part of the corn-soybean mixture of protein concentrates and vitamin B carriers. In some trials the soybeans were cooked and in others were left out of the mixture entirely.

The basal ration was not adequate for the satisfactory growth of either rats or young pigs in dry lot. The addition of casein in amounts sufficient to add 2.25 or 5 per cent protein improved the growth of both rats and pigs. The casein was apparently of no value in improving the utilization of soybeans, and there was no evidence that casein protein supplemented soybean protein. Cooked soybeans were definitely superior to raw soybeans in nutritive value, and less feed was required per unit of gain when the cooked soybeans were fed. However, the protein of cooked beans appeared to have a nutritive value somewhat less than an equivalent amount of casein when fed with corn.

Adding 3 per cent of dried yeast to corn and soybean rations did not improve growth sufficiently to pay for its use.

The acid-base balance in animal nutrition.—IV, The effect of long continued ingestion of acid on reproduction in swine, rats, and rabbits, A. R. Lamb and J. M. Evvard (*Jour. Biol. Chem., 94 (1931), No. 2, pp. 415–422*).—Continuing this study at the Iowa Experiment Station (E. S. R., 47, p. 375), swine were fed for three generations (3.5 years) on a yellow corn, tankage, corn germ meal, and alfalfa meal ration to which was added from 200 to 800 c c of normal sulfuric acid solution per day. Animals receiving the acid showed no bad effects in regard to growth, general health, or reproduction, nor was the composition of the bones unfavorably affected.

Rats were also fed through three generations on a suitable grain, casein, and acid salts ration which contained a total potential acidity of 15 c c of normal acid solution per 100 g of feed without any apparent bad effects and with optimum reproduction.

Rabbits when fed a satisfactory ration were able to tolerate a net acidity up to 5 c c of normal salt solution daily, but beyond this point the animals soon succumbed. Rabbits excreted nearly all the acid as acid phosphates in the urine, and apparently had only slight ability to concentrate ammonia for neutralizing the acid.

Two factors influencing the serum calcium and inorganic phosphate of the rabbit, I, II, E. F. Dupré and E. Semenoff (*Jour. Biol. Chem., 94 (1931), No. 2, pp. 341–351, figs. 6*).—A study was undertaken at the University of Edinburgh, Scotland, to determine the usefulness of the rabbit as an experimental animal for calcium and phosphorus determinations.

Feeding cabbage was found to bring about a marked rise in the blood serum calcium and a simultaneous decrease in inorganic phosphorus, while feeding bran and oats had the opposite effects. In all the work a rise in calcium was accompanied by a fall in inorganic phosphorus and vice versa. The evening calcium level of the rabbit was from 1 to 1.5 mg per cent higher than the morning level, and the change in phosphorus was about the same.

The results indicate that the rabbit is not a suitable animal for calcium and phosphorus determinations, especially in tests covering a period of more than 2 days.

Studies on the toxicity of gossypol, I, II (*Jour. Biol. Chem., 93 (1931), No. 2, pp. 381–405; 94 (1931), No. 1, pp. 221–231*).—These studies were made at the Oklahoma Experiment Station.

I. *The response of rats to gossypol administration during avitaminosis*, W. D. Gallup. The response of rats during vitamin A, vitamin B complex, and vitamin D avitaminosis to gossypol administration was studied, and the results were compared with responses of rats receiving normal diets and equivalent amounts of gossypol. The gossypol was administered by intraperitoneal injections representing 25 and 38 mg per kilogram of body weight, by stomach tubes in 20 mg doses, and in experimental rations at the rate of 0.13 per cent.

Only small differences were noted when intraperitoneal injections were given to normal animals and to animals on a low vitamin A ration. Edema and intestinal inflammation usually followed these injections. Administration of the gossypol by stomach tubes produced diarrhea accompanied by loss of appetite and other disorders which caused the death of many animals on low vitamin A diets. Normal and rachitic animals were able to withstand larger quantities of gossypol administered in this manner before succumbing. Practically all of the animals receiving gossypol in their feed declined, and the few that survived for more than 40 days lost weight at about the same rate irrespective of their condition as regards vitamin depletion. As a rule animals on low vitamin A diets or those that had partially depleted their body stores of this vitamin were more sensitive to gossypol than control animals. When the excess calcium was removed from the ration of rachitic animals, death followed shortly after the administration of gossypol.

II. *The effect of gossypol upon the apparent digestibility of protein, fat, and carbohydrate and upon the absorption of glucose from the gastrointestinal tract of the rat*, W. D. Gallup and R. Reder.—Digestion trials were carried out at frequent intervals during a 90-day period with rats fed the control ration containing 3 c c of refined cottonseed oil per 100 g of feed and with a similar lot receiving an equivalent amount of crude cottonseed oil containing 60 mg of

gossypol. At the end of the period the rate of absorption of glucose was determined.

The apparent coefficients of digestibility of protein, fat, and carbohydrates of rats receiving 0.06 and 0.12 per cent of gossypol, respectively, remained practically constant throughout the test period, and were practically the same as the coefficients determined for the control rats. These results indicate that the ingestion of gossypol in amounts of 7 and 11 mg daily does not impair digestion.

The absorption studies showed that within a given period of time a smaller percentage of glucose was absorbed by the rats consuming 0.12 per cent of gossypol daily than by the controls. However, a comparison of the coefficients of absorption failed to confirm this finding.

The authors conclude that chronic gossypol poisoning can not be attributed to nutritional failure due to impaired digestion and absorption.

A chamber for measuring the oxygen consumption of animals, A. E. Koehler (*Jour. Biol. Chem., 95 (1932), No. 1, pp. 67–72, figs. 2*).—In this article the author describes a simple and practical type of chamber for indirect animal calorimetry especially suitable for small animals.

The measurement of the oxygen consumption of small animals, J. E. Davis and H. B. van Dyke (*Jour. Biol. Chem., 95 (1932), No. 1, pp. 73–78, figs. 3*).—The apparatus described in the preceding paper was modified by the authors for use with such animals as mice, rats, and guinea pigs.

Investigations into the intensive system of grassland management, II, III (*Jour. Agr. Sci. [England], 21 (1931), No. 2, pp. 220–232, figs. 5; 233–240, fig. 1*).—This is a continuation of the study previously reported (E. S. R., 67, p. 157).

II. *The mineral content of intensively treated pasture and a relationship between the nitrogen and phosphorus contents,* A. W. Greenhill and H. J. Page.—Pastures representing from 3 to 5 weeks' growth under the intensive system of grassland management were analyzed for mineral content. The lime content of the grasses varied considerably during the season, but there were no indications of a definite seasonal trend. The average seasonal content was practically the same in all cases. The phosphoric acid content showed a definite seasonal trend, decreasing during drought or the early summer flush period, and increasing again after the drought or flush period. There was significant correlation between the phosphoric acid and the nitrogen contents. Variations in total ash and silica contents during the season were less definite. The good-quality untreated pastures contained less total ash and phosphoric acid than the intensive pastures, but similar amounts of lime and silica.

III. *The seasonal variation in the mineral content of pasture with particular reference to drought,* W. S. Ferguson.—In this phase of the study drought conditions were found to affect seriously the mineral content of pastures. Calcium showed a slight decrease during drought periods and a more marked decrease during periods of heavy rains. The phosphorus content decreased during periods of drought but rose rapidly at the end of the year, while the potassium content was maintained at a fairly high level during drought but decreased late in the year. Sodium remained steady during drought and increased during the rainy season, while chlorine showed a definite increase during drought and a decrease at the end of the year. Nitrogen was dependent to a marked degree upon rain, with low values being obtained during drought and high values during wet periods.

Fattening calves in dry lot versus pasture, P. Gerlaugh (*Ohio Sta. Bimo. Bul. 155 (1932), pp. 46–49*).—Continuing this study (E. S. R., 63, p. 368), two lots of 16 calves each were fed from May 19 to November 3 on a basal ration

of shelled corn and a protein supplement of equal parts of linseed meal and cottonseed meal. Lot 1 was fed in a well ventilated barn with no outside lot and received mixed hay and corn silage as roughage. Lot 2 was turned on about 12 acres of pasture. All calves averaged 428 lbs. in initial weight, and both lots made an average daily gain of 1.9 lbs. per head.

The calves in lot 2 made more economical gains than those in lot 1, but due to their higher condition the latter calves had a higher market value and returned a greater profit. It is recommended that where calves are run on pasture they should be fed grain, and that full feeding of grain should start not later than the first of August in order to have a choice product for the Christmas markets.

Growth and the development of mutton qualities in the sheep, J. Hammond (*Edinburgh: Oliver and Boyd, 1932, pp. XXVI+597, [pls. 53], figs. [89]*).—This monograph was prepared to give an insight into the scientific principles involved in the production of meat from the physiological, anatomical, and practical standpoints. The biological problems involved in animal breeding in general and in meat production in particular are discussed in detail.

A section, study of the leg of mutton, was prepared in conjunction with A. B. Appleton.

Lamb feeding experiments with grains and dried beet pulps, J. A. Holden (*Nebraska Sta. Bul. 268 (1932), pp. 15, fig. 1*).—In this study 13 lots of 25 lambs each were fed for 120 days during each of three consecutive winters. The first lot each year was fed on corn and alfalfa hay; the next four lots received either corn, barley, dried molasses pulp, or dried plain pulp with cottonseed cake and alfalfa hay; the next four lots the same concentrates with cottonseed cake, beet tops, and alfalfa hay; and the last four lots the same concentrates with cottonseed cake, corn silage, and alfalfa hay.

The addition of cottonseed cake to a corn-alfalfa ration increased the rate and economy of gains and produced lambs with a higher selling value. Corn produced faster and more economical gains, and lambs so fed had a higher market value than those on barley, dried molasses pulp, or dried plain pulp. There was little difference in the feeding value of the barley, dried molasses pulp, and dried plain pulp, and they appeared to be worth about 75 per cent the value of corn. The dried molasses pulp was somewhat more palatable than the dried plain pulp. Beet tops increased the gains, reduced the requirement of concentrates and alfalfa hay per unit of gain, and increased the selling price. While corn silage had no marked effect upon gains or selling price of lambs, it materially reduced the hay consumption.

The use of cottonseed meal, cottonseed hulls, and molasses in fattening rations for New Mexico range lambs, P. E. Neale (*New Mexico Sta. Bul. 206 (1932), pp. 11*).—Continuing the lamb feeding studies (E. S. R., 62, p. 761), 5 lots of 20 lambs each were fed during 2 consecutive winters for 112 and 98 days, respectively. The rations fed in the respective lots consisted of 0.75 lb. of corn, 0.25 lb. of cottonseed meal, and alfalfa hay ad libitum; 0.5 lb. of cottonseed meal and cottonseed hulls ad libitum; a mixture of 1 lb. of cottonseed meal and 2.75 lbs. of ground cottonseed hulls; 1.25 lbs. of cottonseed meal and cottonseed hulls ad libitum; and a mixture of 0.5 lb. each of cottonseed meal and cane molasses and 2 lbs. of ground cottonseed hulls. The average daily gains the first year were 0.31, 0.2, 0.24, 0.26, and 0.26 lb. per head and the second year 0.31, 0.25, 0.29, 0.29, and 0.36 lb. per head in the respective lots.

The addition of cane molasses increased the rate and economy of gains, eliminated death losses, and improved the general health and appearance of lambs when compared with lots which received rations made up wholly of

cottonseed meal and hulls. Cottonseed hulls were hard to grind and mix with other feeds, and the cost of grinding made the practice unprofitable. Grinding did not seem to increase the digestibility of the hulls. The lambs made faster and more economical gains when the mixed feed was kept before them at all times than when it was fed in amounts that they would clean up in a moderate length of time.

Cottonseed meal at the rate of 1 lb. daily could be fed with hulls for 60 days without injurious effect, but lambs receiving 1.25 lbs. were hard to keep on feed after 75 days and their general appearance was poor. The injury caused by rations made up of meal and hulls more than offset the cheapness of gains made by these rations. When lambs showing slight cottonseed meal injury were put on good alfalfa hay or green pasture they usually recovered but did not gain for 2 or 3 weeks. Cottonseed hulls have not compared favorably in price with alfalfa hay in sections where alfalfa can easily be grown.

Mineral metabolism in the pig and the addition of inorganic mineral supplements to the pig's diet, E. J. SHEEHY and R. J. SENIOR ([*Irish Free State*], *Dept. Agr. Jour., 30 (1931), No. 1, pp. 1–63, pls. 4, figs. 3*).—Experiments were undertaken at the Albert Agricultural College, University College, Dublin, to test the accuracy of previous conclusions regarding mineral feeding to swine and to ascertain definite information as to the necessity of mineral supplements and the conditions necessary for their efficient utilization. Group tests, extending over long feeding periods, and precise balance experiments were used as sources of data.

The results of the study showed that cereals and their by-products and vegetable cakes were seriously deficient in lime. Inorganic mineral supplements were assimilated by swine, and the balance tests showed an increased retention of calcium and phosphorus when these elements were added under proper conditions to rations in which they were deficient. When a ration consisted mainly of cereals and their by-products and with no skim milk, fish meal, or meat meal, calcium and salt were likely to be deficient. The addition of iodine, iron, sulfur, and potassium to such a ration produced no beneficial results. Phosphates, which are abundant in cereals, were usually not needed in such a ration.

Calcium supplied either in the form of a phosphate or carbonate gave good results. A fairly pure ground limestone or a mixture of ground limestone and steamed bone flour fed at a 2 per cent level was a satisfactory source of calcium. The assimilation of minerals required the presence of the antirachitic factor, which could be supplied by sunshine or cod-liver oil. In the absence of the antirachitic factor, rickets, "cramp," "staggers," and convulsions were brought on, even though abundant minerals were fed. A deficiency of minerals resulted in soft bone, unthriftiness, poor development, depraved appetite, and ultimately rickets.

Suckling pig losses and anemia, L. P. DOYLE (*Indiana Sta. Circ. 188 (1932), pp. 8, figs. 7*).—The cause, effects, and prevention of anemia in suckling pigs are described in this publication.

A study of mortality among young pigs, C. E. AUBEL, J. S. HUGHES, and H. F. LIENHARDT (*Kansas Sta. Tech. Bul. 31 (1932), pp. 22, figs. 3*).—This study was undertaken to determine whether the mortality rate of young pigs could be reduced by increasing the amount of vitamin B in the ration of pregnant and lactating sows. Two groups of five pigs each were fed for each of four years on the same basal ration except that in the experimental lot 10 per cent of wheat germ meal replaced a like amount of ground yellow corn. A study of the ability of each sow to produce milk was made by weighing pigs on different days before and after suckling and rating the sows for milk produc-

tion on the basis of gain in weight of the pigs. In order to prevent anemia during the suckling period iron sulfate was applied to the udders of the sows in the last two years.

Sows receiving wheat germ meal farrowed an average of 9.1 living pigs per litter and weaned an average of 5.4 pigs, or 59.3 per cent. The sows on the basal ration farrowed an average of 8.7 living pigs and weaned 4.9 pigs, or 56.1 per cent. This difference showed a slight advantage for the feeding of wheat germ meal, but was not large enough to be significant. No sow receiving wheat germ meal was considered a poor milker, while four of the check sows were poor milkers. In the check lot the very good milking sows raised 7 pigs per litter, while poor milking sows raised 2.25 pigs, and in the wheat germ meal lot the very good milking sows raised 7.6 pigs and the fair milking sows 3.8 pigs.

Hog feeding experiments, F. B. Headley (*Nevada Sta. Bul. 125 (1932), pp. 30, figs. 14*).—Supplementing results previously reported (E. S. R., 59, p. 867), a series of tests were conducted in cooperation with the U. S. D. A. Bureau of Plant Industry to determine methods of feeding hogs best adapted to Nevada conditions.

Pigs receiving a 2 per cent grain ration on alfalfa pasture reached a 200-lb. market weight 8 days earlier than those receiving alfalfa hay, but when the grain ration was increased there was no significant difference in time. As the percentage of grain increased from 2 to 4 per cent and to self-feeding, the feed required per unit of gain increased, but there was little difference between groups on alfalfa pasture and those on alfalfa hay. A 2 per cent ration produced the cheapest gains, but with the heavier rations pigs reached 200 lbs. in weight from 18 to 58 days earlier. Increasing the percentage of grain as the pigs increased in weight increased the feed required per unit of gain somewhat, but was more economical because of the saving in labor, milk, and roughage than the practice of feeding a 2 per cent grain ration or of increasing the percentage of grain irrespective of weight of pigs.

Adding 5 per cent of tankage to a ration supplemented with alfalfa hay and a heavy allowance of skim milk did not improve the rate or economy of gains. The amount of barley required per unit of gain increased as the percentage of grain fed to pigs receiving skim milk on alfalfa pasture increased, but all things considered the 2 per cent ration appeared to be most economical.

The barley required per unit of gain increased as the proportion of alfalfa meal in a barley-alfalfa meal mixture decreased, but the greater the amount of grain fed the faster were the gains and the lower the milk requirements. On alfalfa pasture a 3 per cent barley ration was more economical in amount of milk, pasture, and labor required than a 2 per cent ration. Self-feeding was found to be cheaper than hand-feeding.

The most desirable ration could be determined only by calculating the probable total cost and receipts to be obtained. Pigs made the most rapid gains when fed a ration containing less than 5 per cent of crude fiber, and in these tests the number of days required to reach market weight increased 5.4 for each 1 per cent increase in fiber content of the ration. Each pound of variation in initial weight of pigs resulted in an average change of 1.3 lbs. in gain at the time market weight was reached.

It was found that the total feed and overhead cost for maintaining a mature boar for one year was $55.47.

The use of tankage and alfalfa when hogging down corn, L. Vinke and G. Morgan (*Montana Sta. Bul. 257 (1932) pp. 19*).—Continuing this series of five tests (E. S. R., 64, p. 256), it was found that as a supplement to hogging down corn, tankage increased the rate of gain and the amount of pork produced

per acre as compared with lots receiving no supplement or lots receiving alfalfa hay. The same was true of alfalfa hay, but in lesser degree, as compared with lots receiving no supplement. The combination of tankage and alfalfa did not increase the rate of gain or the amount of pork produced per acre over tankage as the sole supplement. It is concluded that whether or not it is profitable to feed tankage as a supplement in hogging down corn depends upon the relative prices of hogs, tankage, and alfalfa, and the amount of supplement fed.

Wheat alone versus wheat and tankage for fattening pigs, O. S. WILLHAM ([*Oklahoma*] *Panhandle Sta., Panhandle Bul. 37 (1932) pp. 3-6*).—In this test two lots of five pigs each, averaging 64 lbs., and one lot of five pigs, averaging 94 lbs. in initial weight, were fed for 76 days. Lot 1 received a mixture of 500 lbs. of ground wheat and 50 lbs. of tankage; lot 2, 500 lbs. of wheat; and lot 3, 500 lbs. of wheat and 25 lbs. each of tankage and cottonseed meal. All of the mixtures contained 3 lbs. of salt. The average daily gains in the respective lots were 1.8, 0.7, and 1.7 lbs. per head. The cost per 100 lbs. of gain was lowest in lot 1 and highest in lot 2, but there was only a slight difference in lots 1 and 3. The test showed that it was not advisable to feed wheat without a protein supplement, and that it was reasonable to expect pigs to make 100 lbs. of gain on from 375 to 400 lbs. of wheat fed in combination with either tankage or tankage and cottonseed meal.

Feeding brewer's rice to hogs, C. I. BRAY (*Louisiana Stas., Rice Sta. Bien. Rpt. 1930–31, pp. 24–27*).—The results are reported of a study on feeding brewer's rice to hogs as compared with corn, dehydrated soybean hay, and rape pasture.

A statistical analysis of the results of breeding high-line and low-line Leghorns, D. R. MARBLE and G. O. HALL (*New York Cornell Sta. Bul. 533 (1931) pp. 38, figs. 18*).—Continuing this work (E. S. R., 64, p. 667), a statistical analysis was made of the records obtained in this breeding project begun in 1908.

The results show that when careful selection was followed both body weight and egg weight increased simultaneously with an increase in number of eggs. In this work no one factor was sacrificed at the expense of another. It was also found that with the increase in egg production the rate of maturity changed in proportion to the change in production, and it was believed that the change in production was the result rather than the cause. As production increased the length of cycle increased, while at the same time the rate of maturity decreased.

Apparently there was a distinct genetic difference in the two lines of birds. The change in egg production of the low-line birds probably reflected, to a degree at least, the effect of improved feeding and management methods.

The value of dried skim milk for fattening poultry, E. M. FUNK, H. L. KEMPSTER, and C. G. BRYAN (*Missouri Sta. Bul. 309 (1932), pp. 23, figs. 4*).—The object of this study was to compare condensed and liquid buttermilk and dried skim milk as a source of milk for fattening poultry and to determine the percentage of dried skim milk which gives the best results. The effect of breed and age upon gain and the effect of the ration on the final grade of dressed poultry were also studied. A complex and a simple basal ration was used, to which was added either condensed or liquid buttermilk or 5, 10, 15, or 20 per cent of dried skim milk.

Leghorn broilers and hens and Rhode Island Red roasters made the most satisfactory gains, while Plymouth Rock broilers, roasters, and hens had the highest dressing percentage. Leghorn broilers and Rhode Island Red roasters and hens packed the highest percentage of initial weight when fat. Rhode

Island Red broilers and roasters and Plymouth Rock hens had the greatest feed consumption per bird per day, but apparently the ration did not materially influence feed consumption. Leghorns and Plymouth Rocks dressed a higher percentage of quality birds than did Rhode Island Reds, and broilers and roasters graded higher than the hens, due in part at least to the fact that only thinly fleshed hens were fattened. The smaller birds made more rapid gains than the larger birds.

The most satisfactory gains and the highest percentage of initial weight packed were obtained when 10 per cent of dried skim milk was fed, while the lowest dressing loss was secured when 5 per cent was fed. At the feed prices used rations supplemented with 5 per cent of dried skim milk and liquid buttermilk produced the cheapest gains, while condensed buttermilk produced the most expensive gains. On the other hand, the condensed buttermilk produced the highest quality birds with 93.6 per cent of No. 1 birds, while 10 per cent of dried skim milk ranked next with 90.4 per cent of such birds. The simple basal ration was as satisfactory for producing gains as the more complex ration.

Poultry feed supplements: Avocados, bananas, papayas, and sweetpotatoes as supplementary feeds for poultry in Hawaii, C. M. Bice (*Hawaii Sta. Circ. 4 (1932), pp. 24, figs. 15*).—This study was undertaken to determine the feeding value of the above-named fruits and vegetables as supplemental feeds for laying hens and for fattening birds. Papayas, however, were not fed in the fattening rations. In the laying tests 12 lots of 10 Single Comb White Leghorn pullets each were fed the same basal mash and scratch ration for 365 days. The supplements were fed in varying proportions to certain groups, but attempts were made to use as much of each supplement as possible. For fattening, 6 trials, covering 10 days each, were made with 14 fattening rations.

The results showed that when avocados did not exceed 15 per cent of the entire ration they were satisfactory for egg production. Sweetpotatoes and bananas were also satisfactory in this respect. Papayas fed over a long period were detrimental to health and egg production. Avocados, bananas, and sweetpotatoes were economical supplemental feeds, furnishing the necessary nutrients at a low cost. These supplemental feeds when mixed with wheat middlings or yellow corn meal or both were efficient for producing high grade broilers and roasters.

Rations for layers, D. C. Kennard (*Ohio Sta. Bimo. Bul. 155 (1932), pp. 42-44*).—In this test 4 lots of early-hatched pullets were fed for 6 months, beginning July 1, to determine a good ration for layers. All lots received the same protein, mineral, and vitamin supplements. Lot 1 in addition received a grain mash made up of yellow corn, wheat, and ground oats 35 : 20 : 20; lot 2, wheat and ground oats 55 : 20; lot 3, corn and ground oats 55 : 20; and lot 4, corn, wheat, ground oats, and whole oats 15 : 20 : 20 : 20. The average production per bird was 61, 57, 60, and 65 eggs, and the percentage mortality was 24, 10, 20, and 14 in the respective lots. There was no significant difference in the average monthly weight per bird or in the feed consumption.

Short period trapnesting as a means of estimating annual egg production and average annual egg weight, F. J. Dudley (*Harper Adams Util. Poultry Jour., 16 (1930-31), No. 11, pp. 557-562, figs. 4*).—In this paper the author discusses two schemes that were investigated for estimating egg production based on periodical trap nestings. The data were taken from 784 records of birds, some of which were tested for 4 consecutive days per month for 12 months and some 1 day per week for 48 weeks. He points out some of the extreme disagreements that occur between the estimates and the actual production and also indicates the limitations of periodical trap nesting in practice.

A similar discussion is presented on periodical and sustained weighing of eggs.

Some observations on caged layers, D. C. KENNARD and V. D. CHAMBERLIN (*Ohio Sta. Bimo. Bul. 155 (1932), pp. 35–41, figs. 5*).—Some of the results of preliminary tests begun in 1924 with layers kept in wire cages are discussed. In addition new work in progress is outlined in relation to feeding, size of cages, losses of eggs from breakage, and arrangement of quarters. The hopes and expectations from this method of management are indicated, but it is pointed out that they must be substantiated.

Electric brooders on Indiana farms, T. E. HIENTON (*Indiana Sta. Circ. 187 (1932), pp. 4, figs. 2*).—Records are presented for the chick mortality, energy used, and duration of brooding periods of 48 electric brooders metered over a 3-year period.

Sun yards for chickens, D. C. KENNARD and V. D. CHAMBERLIN (*Ohio Sta. Bimo. Bul. 155 (1932), pp. 44–46, fig. 1*).—The advantages of sun yards and sun porches and methods of construction are described in this article.

Growing turkeys in confinement, R. B. THOMPSON, E. E. SCHNETZLER, and W. P. ALBRIGHT (*Oklahoma Sta. Bul. 202 (1932), pp. 16, figs. 17*).—Observations covering a period of 4 years on growing turkeys in confinement, together with recommendations on feeding, housing, selection and management of breeders, and hatching and brooding of poults are included in this bulletin. Appended are tables giving average weights, gain in weight, and feed consumption by weeks of turkeys under different methods of confinement.

" The Feathered World " year book for 1932, edited by O. C. LEWER and A. P. THOMPSON (*London: Feathered World, 1932, 21. ed., pp. 1–552, 639, 640, figs. 264*).—A practical handbook giving general information for producers of poultry, ducks, turkeys, pigeons, guinea fowl, and pheasants.

DAIRY FARMING—DAIRYING

[Feeding and management studies with dairy cattle], R. H. LUSH (*Louisiana Stas. [Bien.] Rpt. 1930–31, pp. 73–83*).—Results are reported from a study of the value of purebred bulls for increasing the production of grade cows, the management of permanent and temporary pastures, composition and yield of pasture grasses, including fertilizer tests and analyses, limited grain feeding for milk production, a comparison of continuous feeding of cottonseed meal and soybean meal on growth and milk production, whole cottonseed for milk production, ground dehydrated soybean hay fed as a concentrate, and methods and costs of raising dairy calves and heifers.

Skimmilk as a feed for dairy cows, C. H. ECKLES and E. N. SHULTZ (*Jour. Dairy Sci., 14 (1931), No. 3, pp. 189–197*).—In trials with a limited number of animals, both cows and heifers, the Minnesota Experiment Station found that skim milk could be used as a protein supplement in the ration of dairy cattle, replacing linseed meal when fed at the rate of 8 lbs. of skim milk to 1 lb. of linseed meal. In areas where the use of surplus skim milk was a problem, the feeding of this milk as a source of protein was economical. The value of this feed should be determined by the market price of protein concentrates. Where young dairy animals were fed a low protein roughage such as timothy hay, skim milk was an economical source of protein.

Two years' feeding of Manamar to a herd of dairy cows, C. F. MONROE and W. D. MAHAN (*Ohio Sta. Bimo. Bul. 155 (1932), pp. 49–55*).—Continuing this study at the Belmont County Experiment Farm (E. S. R., 63, p. 65), it was found that over a period of 2 years the feeding of Manamar had not been accompanied by a statistically significant increase in milk production. The

records of reproduction and the breedings required per conception were not significantly different between the two groups. Manamar compared favorably in feeding value with a mixture of cottonseed meal, bone meal, and salt, but was much higher priced.

The number of daughters necessary to prove a sire, J. L. Lush (*Jour. Dairy Sci., 14 (1931), No. 3, pp. 209–220, figs. 3*).—A theoretical discussion is given from the Iowa Experiment Station, showing the relationship between the average record of the daughters and the genotype of the sire for factors affecting milk production. The author shows that as the number of daughters tested increases the reliance of the progeny test also increases, but at an ever-decreasing rate. He believes that testing five daughters is as practical as any other number, contrary to the recommendation of Davidson (E. S. R., 53, p. 675.)

The influence of age at first calving on milk secretion, C. W. Turner (*Missouri Sta. Research Bul. 164 (1932), pp. 39, figs. 13*).—The Advanced Registry and the Register of Merit records of four breeds of dairy cattle served as a source of data for this study. All first-entry records from earliest age up to and including three years were divided into groups by monthly intervals. Since these records are subject to a minimum entrance requirement, a method of correcting the population of each age group was devised to eliminate this factor.

The youngest heifer in this study, a Jersey, calved at 13 months of age, while the youngest Guernsey was 16 months old and the youngest Ayrshire and Holstein calved at 17 months. The mean ages of calving were for the Jersey 27.3 months, Guernsey 28.5, Holstein 28.8, and Ayrshire 29.8 months. It was observed that with all breeds there was an increase in yearly milk and fat production as age at first calving increased. When these data were plotted the increments in monthly production were observed to follow quite well along a straight line, and an equation of the form $M=A-Be^{-kt}$, in which M is the yearly milk or fat production, A the maximum yearly production as a result of the first pregnancy, B an age parameter, k the rate of increase in milk or fat production, and t the age in months from birth, was found to fit the data satisfactorily.

The increase in fat production with the advance in age at first calving was largely due to growth in body weight. Conversion or correction factors were formulated for comparing the production records made either at 24 or 36 months. The study clearly showed that nothing was gained by delaying the calving of dairy heifers beyond 30 months. While no definite age of calving was found satisfactory for all breeds and under varying conditions, it was concluded that the most efficient milk and fat production was obtained by breeding animals to calve at from 20 to 24 months of age, maximum production about 30 months of age, and within 5 to 10 per cent of maximum production at from 23 to 28 months, depending upon the breed.

Plasma lipids in lactating and non-lactating animals, P. J. Schaible (*Jour. Biol. Chem., 95 (1932), No. 1, pp. 79–88*).—A study was undertaken at the New York Cornell Experiment Station to obtain information on the nature and distribution of the plasma lipids, especially in relation to fat intake and lactation. About 2 l of blood were taken from the jugular vein of dry cows and beef animals and 1 l from lactating cows 1 month after parturition, and these samples were analyzed for total fatty acids, lipid phosphorus, and fatty acid distribution.

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some a plasma of the lactating cows was higher in total fatty acids, lipid phos-

and some nd neutral fat than the plasma of nonlactating cows or steers. The

disagreements is showed individual variations in levels during both the lactation

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and dry periods, and animals showing relatively high values when dry also gave high values when in milk. The plasma lecithin of both lactating and nonlactating animals contained fatty acids of a much lower degree of unsaturation than those of the cholesterol esters, while the iodine number of the fatty acids of neutral fat was intermediate. The data suggest that cholesterol esters play a part in fat transportation.

The character of fatty acids, in spite of the difference in levels from the dry to the lactating period, was similar. This indicates that lactation requires neither a difference in distribution nor kinds of fatty acids, but only a larger quantity.

Sampling milk for fat test at milk plants, J. C. MARQUARDT and H. L. DURHAM (*New York State Sta. Bul. 605 (1932), pp. 13, figs. 4*).—For this study 207 comparisons were made over a period of 2 years. Samples of milk were taken after the unstirred milk was poured into the weigh can, from the milk can after it was stirred but before it was poured into the weigh can, after storage periods of from 4 to 24 hours when the milk was stirred but not poured before sampling, and after similar storage periods when the milk had been mixed by pouring and stirring. Various temperatures were used during the storage periods.

These comparisons demonstrated that dumping milk and sampling at once resulted in a fair sample. A proper sample could be obtained from milk in cans only after complete stirring. The cream adhering to the sides of the cans was not a factor in changing the composition of the milk when the sample was taken from the weigh can.

The uniformity of fat distribution could be checked by sampling milk after dumping in a weigh can and by obtaining another sample after vigorous stirring. From 20 to 200 comparisons were sufficient to establish the accuracy of routine methods of sampling. Because of variations in equipment from plant to plant each piece of equipment should be checked to establish its correctness for properly sampling milk.

Cooling milk on Nebraska farms, P. A. DOWNS and E. B. LEWIS (*Nebraska Sta. Bul. 266 (1932), pp. 31, figs. 19*).—The data for this study were secured from tests and trial set-ups at the college and near-by dairies. Recording thermometers, thermocouples, and precision and milk thermometers were used for the temperature readings, while recording hygrometers and sling psychrometers were used for the humidity records. Cooling was carried on in air at or near zero and at or near freezing temperatures and with water ranging in temperature from 33 to 65° F. These media were used in a range of circulation rates from still air and still water to positive circulation of large volumes of each. Bacterial counts were made on all milk samples.

In order to retard bacterial growth, milk had to be cooled in from 1 to 1.5 hours to temperatures of 60° or below. Clean milk, low in bacterial count, required less care in cooling than poor grades. However, cooling did not materially reduce bacterial counts.

Circulating water required very simple equipment as a medium for transferring heat from small quantities of milk. Rapid circulation of the cooling medium was necessary for quick cooling, and careless operation often caused failure even with good equipment. In most cold storage rooms forced circulation of air was necessary.

Elimination of extra equipment and good arrangement of equipment hastened all cooling. It was found that a definite knowledge of cooling effects and requirements was essential to successful operation. Defrosting of brine tanks regularly was found to be a good practice.

Pasteurizing and cooling milk in the vat to secure maximum creaming, J. C. Marquardt and A. C. Dahlberg (*New York State Sta. Tech. Bul. 189 (1932), pp. 19, figs. 2*).—Continuing this study (E. S. R., 66, p. 569), it was found that the rate at which milk is cooled in the pasteurizing vat is of great importance in affecting creaming, while the vigor of agitation during heating and cooling is of less significance.

The decrease in cream layer volume due to slow cooling in the vat was pronounced after 2 and 4 hours' creaming and less noticeable after 24 hours. Very rapid cooling of milk preserved its normal creaming properties. It was found that the entire time required to heat milk and hold it at the pasteurizing temperature for 30 minutes and to cool it to 40° F. was approximately 1 hour. Of this period 20 minutes or less was necessary to reduce the temperature from 143 to 40° in a rapid cooling vat.

There was a tendency for pasteurized, cooled milk held cold for 1 hour, a period usually necessary for bottling, to lose some of its creaming properties. The extent of this reduction in cream layer volume varied from an insignificant amount to appreciable quantities, and the reduction was affected by the milk itself and its previous processing.

The pasteurization efficiencies secured with milk from individual farms, R. V. Hussong and B. W. Hammer (*Iowa Sta. Bul. 286 (1931), pp. 345–358*).—Samples of morning milk delivered to two small market milk plants were collected in the receiving room and were iced at once. Bacterial counts were made of raw and pasteurized milk by the macroscopic colony count. Pasteurization was carried out in small test tubes in a water bath at 142° F. for 30 minutes. After heating the tubes were plunged into cold water and plated as soon as possible.

Large variations occurred in the percentages of organisms killed in samples from individual farms. These variations were found not only in samples from different farms but in different samples from the same farm. In the case of one farm having high bacterial counts in the pasteurized milk, a change in methods of caring for utensils and equipment on the farm resulted in lower initial counts and higher pasteurization efficiencies, and when initial counts increased, due to hot weather, the higher efficiencies persisted.

There was no close relationship between initial counts and pasteurization efficiencies, but there was a tendency for high initial counts to be accompanied by high efficiencies and vice versa. In some cases the counts obtained after pasteurization were higher than the initial counts, indicating a resistant type of flora. Some of the negative efficiencies were secured at about the time other samples from the same farm were giving low pasteurization efficiencies. In some cases low counts on pasteurized milk were obtained when the milk was produced and handled so that it had low initial counts.

Thermophilic bacteria in milk pasteurized by the holder process, R. S. Breed (*New York State Sta. Tech. Bul. 191 (1932), pp. 27*).—This paper was written to discuss the relation of thermophilic bacteria to low temperature pasteurization.

A review of work of this and other stations showed that the standard agar plate counts made in routine milk control work are not sufficient to show the real bacterial condition of pasteurized milk. It is recommended that direct microscopic examination of such milk be made simultaneously with the agar plate examination. When large rod-shaped bacteria were revealed under the microscope they indicated the probable presence of thermophilic bacteria, and incubation of additional plates at 55° C. showed whether this assumption was correct. Bacteria in pasteurized milk that stained well in methylene blue were usually found to be alive. This failure of obligate thermophiles to grow on

plates as ordinarily incubated limits the usefulness but does not discredit the use of the standard agar plate in the official control of pasteurized milk.

The author discusses the growth and use of the agar plate counts in routine milk control.

The relation of certain plant processes to flavor development in market milk, P. H. TRACY and H. A. RUEHE (*Jour. Dairy Sci., 14 (1931), No. 3, pp. 250–267*).—This study was undertaken at the Illinois Experiment Station to determine the relationship existing between certain marketing operations that are necessary to give raw milk a desirable form and place utility and the flavor developed in the milk. In the absence of more suitable methods the flavor of the milk was determined by taste.

An effective grading system, which provided for bacterial, flavor, and temperature control in the raw milk to the time of delivery, was necessary for controlling flavor. Pasteurization improved the flavor of most raw milks, but continued heating at 142° F. for over 1 hour resulted in a noticeable cooked flavor. Contacts with either iron or copper surfaces often caused the development of a tallowy flavor. Milk exposed to sunlight may develop either a tallowy or a burnt flavor. Diffused light was particularly important in the development of the tallowy flavor in milk, especially that containing an added copper salt.

The use of chlorine sterilizers should be confined to noncorrosive metals, and all equipment treated with chlorine sterilizers should be rinsed with uncontaminated water before milk comes in contact with it. If this precaution is not taken off flavors develop.

The germicidal action of raw milk upon an organism of the sweet curdling type, H. R. CURRAN (*Jour. Dairy Sci., 14 (1931), No. 3, pp. 276–282*).—The U. S. D. A. Bureau of Dairy Industry found that certain samples of mixed raw milk exerted a marked restraining action upon an organism capable of rapidly producing a sweet curdling type of fermentation. This action was present in the milk over a period of several months.

The coagulation caused by the sweet curdler was delayed from 3.5 to 6 hours in different samples of mixed raw milk and usually occurred when the population attained from 10 to 40 million. The germicidal activity in this work was confined to Jersey milk.

In this test *Streptococcus lactis* exerted but little influence upon the development of the sweet curdler and was only slightly restrained by the bactericidal activity of the milk. Both the sweet curdler and *S. lactis* multiplied more rapidly in heated than in nongermicidal milk. These observations indicate that the strong germicidal action of milk may be of distinct value in protecting the supply under certain conditions.

The effect of acidity on Lactobacillus acidophilus cultures, L. A. BLACK and J. C. HARRIS (*Jour. Dairy Sci., 14 (1931), No. 3, pp. 198–208*).—Continuing this study at the Washington Experiment Station (E. S. R., 65, p. 565) with five strains of *L. acidophilus*, it was found that the highest plate counts were obtained at acidities of approximately 1 per cent. A decrease took place in the number of organisms in all but one strain when the acidity reached about 1.2 per cent and at acidities of approximately 1.5, 1.6, 1.7, and 1.8 per cent a still greater destruction of organisms occurred. Samples of each strain which gave the highest count before storage usually gave the highest count after storage at 9 and 24° C. Storage at 9° resulted in less destruction in number of organisms than storage at from 20 to 24° in both high and low acidities. Two strains of the organisms survived either room or refrigerator temperature storage for several days without great loss in number of organisms when the original acidity was low.

The study showed the desirability of determining the acidity and the conditions under which maximum number of organisms was obtained for each strain. It also showed that the acidity at which the maximum number of organisms was secured during incubation was an indication of the acidity at which to place cultures in refrigerator storage.

Bacteriology of butter.—IV, Bacteriological studies on surface taint butter, H. A. DERBY and B. W. HAMMER (*Iowa Sta. Research Bul. 145 (1931), pp. 385–416*).—Continuing this series of studies (E. S. R., 66, p. 169), it was found that surface taint butter often contained large numbers of bacteria and usually had large numbers of yeasts, and also the mold counts were high in some cases. In all such samples the numbers of organisms on the surface portion were higher than on the interior portion of the sample. The general types of bacteria were essentially the same as those found in any butter containing large numbers of organisms.

This defect of butter could not be produced by inoculating a normal product, either salted or unsalted, with tainted butter, but could be produced by inoculating tainted butter into pasteurized cream and churning the cream. The surface taint developed in from 2 to 4 days at 60° F. (15.6° C.) and from 7 to 10 days at 41°. Surface taint developed in commercial butter held at temperatures favorable for bacterial growth, and such butter was usually unsalted or had a low salt content. Excessive numbers of organisms were found in surface taint butter, either experimental or commercial, when examined under the microscope.

The predominating organisms isolated from defective butter did not produce the taint when inoculated into pasteurized cream and the cream churned. An undesirable organism capable of producing surface taint when inoculated into pasteurized cream was isolated from a sample of Canadian butter and tentatively designated *Achromobacter putrefaciens*. This organism was found in comparatively small numbers. By modification of methods the organism was later isolated from five additional samples. Other organisms that would produce surface taint were isolated from a number of samples of defective butter, but they were always found in small numbers. In the case of some tainted samples no organisms that would produce the defect could be isolated.

Medium salt percentages or the use of butter cultures greatly hindered the growth of the surface taint organisms. Attempts to produce surface taint with *Pseudomonas fluorescens* inoculated into pasteurized cream regularly resulted in the development of rancidity. Suggestions are given for the control of surface taint.

Appended is a description of *A. putrefaciens*.

Studies on the development of butter cultures from mixtures of organisms, R. S. FARMER and B. W. HAMMER (*Iowa Sta. Research Bul. 146 (1931), pp. 24*).—This study was carried out to determine some factors of importance in the development of butter cultures from mixtures of *Streptococcus lactis* and either *S. citrovorus* or *S. paracitrovorus*.

It was found that certain strains of *S. lactis* had characters which made them unsatisfactory for the development of butter cultures, while others in combinations with citric acid fermenting streptococci produced satisfactory cultures. Some unselected strains of organisms combined well, while others did not, and as a rule the organisms which produced good flavors when grown alone combined well. The average volatile acidity produced in milk by 71 citric acid fermenting strains was 20.3 per cent ranging from 7.1 to 30 per cent, and in milk plus 0.4 per cent citric acid the average was 57.2 per cent, ranging from 25 to 84.8 per cent. There was no correlation between the rate

or amount of volatile acid formed and the ability of a citric acid fermenter to develop a satisfactory butter culture in combination with *S. lactis*. Certain combinations of organisms were very constant in their ability or inability to develop good cultures. Some combinations produced a good butter culture aroma and flavor in the first transfer to pasteurized milk, while with others several transfers had to be made. Rapid procedures for the selection of satisfactory organisms were advantageous, since relatively few combinations of identified organisms were satisfactory.

With reasonably uniform methods of propagation butter cultures showed a surprising stability. Regardless of the number of organisms in the original mixture, the *S. lactis* and citric acid fermenters established a relationship that produced the same general aroma and flavor, even when the milk in which they grew was not coagulated during a series of transfers. Butter cultures were carried satisfactorily by making transfers every other day in tubes of litmus milk and incubating at 21° C. The cultures developed better at 25.5 or 21° than at 37, 19, or 15°. The maximum periods at which ripened cultures could be held were 1 day at 37°, 3 days at 30°, 7 days at 21°, about 1 month at 7°, and about 2 months at approximately −10°. The cultures could generally withstand freezing and thawing from 5 to 7 times without destroying their ability to produce good flavor and aroma.

S. lactis cultures could be held in litmus milk and remain satisfactory for the development of butter cultures for 1 day at 37°, 3 days at 30°, 6 days at 21°, at least 3 months at 7°, and at least 5 months at approximately −10°. Adding calcium carbonate to the milk greatly increased the time that an *S. lactis* culture would remain in a satisfactory condition. Citric acid fermenting streptococci remained in a satisfactory condition at room temperatures for at least 8 months when placed in sealed test tubes, and until shortly before the cultures were dry when in tubes in which evaporation was not checked. Adding calcium carbonate to the milk kept the cultures in good condition for approximately 1 year at room temperatures.

Butter cultures propagated in dairy plants for varying periods were at times as satisfactory as cultures shipped in, but in other cases had been contaminated. Some cultures were greatly affected by the germicidal properties of milk, while others were not.

The influence of sweetened, frozen cream on the development of swell in ice cream, W. V. PRICE (*Jour. Dairy Sci., 14 (1931), No. 3, pp. 221–228, figs. 3*).—A series of tests was undertaken at the Wisconsin Experiment Station to determine the effect of the addition of sugar to cream which was subsequently frozen, held, thawed, and then used to make ice cream. A quantity of fresh, pasteurized cream was divided into four parts. One part was stored at approximately 35° F. The other three parts were frozen at −15°. Sucrose was added to the third part before freezing at the rate of 1 part of sugar to 10 parts of cream by weight, while invert sugar was added to the fourth part at the rate of 1.33 parts to 10 parts. The cream was stored for 48 hours and then made into ice cream.

It was found that ice cream mix containing sweetened frozen cream as the sole source of milk fat had better whipping properties than a mix made with nonsweetened frozen cream. Sucrose and invert sugar were equally effective for sweetening cream when the concentration of each caused approximately the same freezing point depression. There were some indications of a possible relationship between lecithin and the swell developed in an ice cream mix.

Lessening corrosion from hypochlorites, C. K. JOHNS (*Milk Dealer, 21 (1931), No. 2, pp. 52, 53*).—In a study at the Central Experimental Farm,

Ottawa, Canada, it was found that a relatively noncorrosive hypochlorite solution which is still fast-acting enough for use as a flush rinse or spray solution in dairies may be obtained by the addition of from 0.25 to 0.5 per cent of sodium carbonate.

VETERINARY MEDICINE

The principles of animal hygiene and preventive veterinary medicine, L. VAN ES (*New York: John Wiley & Sons; London: Chapman & Hall, 1932, pp. X+768, figs. 78*).—Following an introduction, the first chapters of this work deal with the subject under the headings of heredity, soil, air and ventilation, water, food, radiant energy, weather and climate, stables and inclosures, individual care and management, disposal of wastes, disinfection and disinfectants, and disinfestation and disinfestants. The remaining 40 chapters deal with the infectious diseases and parasites of livestock. A brief list of bibliographic references is appended to each chapter.

Recent advances in bacteriology, J. H. DIBLE (*Philadelphia, Pa.: P. Blakiston's Son & Co., 1932, 2. ed., pp. XI+476, figs. 29*).—A review of recent work in bacteriology and disease infections presented in 22 chapters, each chapter including a list or lists of references to the literature considered.

A comparison of the anthelmintic properties of hexylresorcinol and heptylresorcinol, P. D. LAMSON, E. L. CALDWELL, H. W. BROWN, and C. B. WARD (*Amer. Jour. Hyg., 15 (1932), No. 1, pp. 306–314*).—In continuation of their studies (E. S. R., 66, p. 771), the authors have found heptylresorcinol to have approximately the same anthelmintic properties on ascarids in vitro as hexylresorcinol. Heptylresorcinol removed both ascarids and hookworms from dogs about as readily as hexylresorcinol. In two groups of cases treated under field conditions with hexylresorcinol and heptylresorcinol, respectively, it was found that the former removed a higher percentage of hookworms, ascarids, and trichurids than did heptylresorcinol. There is said to be no evidence at present that heptylresorcinol is a better human anthelmintic than hexylresorcinol.

Outline of clinical hematology of the domestic animals, D. WIRTH (*Grundlagen einer Klinischen Hämatologie der Haustiere. Berlin: Urban & Schwarzenberg, 1931, pp. VIII+311, pls. 8, figs. 51*).—A general account (pp. 1–108) is followed by accounts of the normal blood of domestic and some other animals, some 30 in number (pp. 109–137), and special pathological hematology (pp. 138–281). An extended bibliography (pp. 282–306) and an index are included.

Neoplasms of domesticated animals, W. H. FELDMAN (*Philadelphia and London: W. B. Saunders Co., 1932, pp. 410, figs. 193*).—The subject is dealt with in 23 chapters, each of which is accompanied by a bibliography. In addition to chapters on the various neoplasms, chapters on their biology (pp. 17–31), general characteristics (pp. 32–59), incidence (pp. 60–78), experimentally transmissible tumors (pp. 373–387), and preservation of pathologic material (pp. 388–392) are included.

Investigation on the reductant power of tissue of infected animals, H. C. D. GOLLEDGE (*Thesis, Univ. Zurich, 1931, pp. 42, figs. 6*).—Part 1 of this work, introductory in nature, consists of general remarks on oxidation and reduction (pp. 3–21), and part 2 deals with the influence of infection (pp. 22–40).

Allergy and immunity in coccidial infections, D. P. HENRY (*Soc. Expt. Biol. and Med. Proc., 28 (1931), No. 8, pp. 831, 832*).—In this contribution the author reports upon the development of an immunity in guinea pigs infected with *Eimeria caviae*, together with the appearance of degenerate forms of the

parasite in partially immune animals, observations on the production of hypersensitivity to the protein of the infecting organism, and a cutaneous hypersensitiveness to *E. caviae* in this host. While the mortality in guinea pigs upon infection with *E. caviae* for the first time has been found to be 40 per cent, not one of the guinea pigs infected two or more times died from a typical coccidial infection.

Natural immunity and disease resistance (*Imp. Bur. Anim. Genet. [Edinb. Univ.], Quart. Bul., 2 (1931), No. 4, pp. 73–85*).—This subject is dealt with from the genetic point of view.

The experimental transmission of anaplasmosis by Dermacentor variabilis, C. W. REES (*Science, 75 (1932), No. 1942, pp. 318–320*).—The author reports upon experiments conducted in which, under properly checked and controlled conditions, he succeeded in transmitting anaplasmosis by means of the American dog tick. Ticks that engorged as larvae on clinical cases of anaplasmosis transmitted the disease as nymphs to two susceptible bulls, as did adult ticks that engorged as nymphs on a convalescing case of anaplasmosis. A test made of transmission through the egg was negative when the ticks engorged as adults on a clinical case and the larvae of the next generation engorged on two susceptible bulls.

Further observations on anaplasmosis, W. H. BOYNTON (*Cornell Vet., 22 (1932), No. 1, pp. 10–28, figs. 6*).—In further work conducted in California (E. S. R., 62, p. 561) a staining technic has been developed which reveals certain forms of *Anaplasma marginale*, hitherto undescribed, which may tend to be of etiological significance. Four types of the disease, depending upon the severity of the infection, the resistance of the animal, and the ability of the infected animal to regenerate its red blood cells are recognized, namely, the mild, peracute, acute, and chronic.

The mild type, characterized by scarcely visible symptoms or by mild symptoms simulating dietary disturbances, may be entirely overlooked unless the marginal bodies are detected by blood examination. The rapid course and high mortality in the peracute type may lead to its confusion with other maladies. A definite diagnosis can only be made by blood examination. The acute type is characterized by profound anemia and by jaundice with such accompanying symptoms as constipation, muscular tremors, weakness, rapid pulse and respiration, drooling from the mouth, inappetence, fever, and rapid emaciation. Recovery is apparently dependent on the ability of the animal to regenerate red corpuscles, evidenced by the presence of megalocytes, followed in order by chromatophilic, punctate basophilic, and nucleated red cells in the circulation. With the onset of regeneration, the marginal bodies gradually disappear. The chronic type takes a more protracted course than the acute and the symptoms are more pronounced, especially the anemia and icterus and the condition of weakness. Regeneration of red cells sets in late in the course of the disease, and sufficient new corpuscles may or may not be produced to sustain life.

The disease is not transmitted through cohabitation. While investigators have claimed to be able to transmit the disease from mother to offspring through the placenta, the author's experiments failed to confirm such work. By injecting susceptible calves with blood from recovered cases which had been treated with sodium cacodylate, it was proved that these recovered animals remained carriers. Good care is considered by the author more essential than drugs in the treatment of anaplasmosis. So far as is known, nothing can be done to save cases of the peracute type and of the acute and chronic forms in which regeneration of red cells does not occur or is too inadequate to sustain life.

A further study of Brucella infection in Iowa, A. V. HARDY, C. F. JORDAN, and I. H. BORTS (*Pub. Health Rpts.* [*U. S.*], *47* (*1932*), *No. 4, pp. 187–193*).—In this further study (E. S. R., 64, p. 265; 65, p. 671), cattle were found to be responsible for more than half the human cases. It is pointed out, however, that since the disease of porcine origin is of greater severity, hogs and cattle are of equal significance as a source of undulant fever morbidity.

Agglutinin absorption studies on the genus Brucella, W. N. PLASTRIDGE (*Jour. Bact.*, *23* (*1932*), *No. 1, pp. 111, 112*).—This is a report upon a study of the serological characteristics of 142 strains of Brucella of human, bovine, porcine, and caprine origin made for the purpose of comparing the results of the agglutinin absorption test with the ability to utilize dextrose and to grow on liver infusion agar containing the dyes methyl violet (1:100,000), basic fuchsin (1:50,000), and thionine (1:50,000), respectively. The author finds the results obtained in work at the Connecticut Storrs Experiment Station to confirm the opinion of a leading investigator that while it is possible to classify a given strain as *B. melitensis*, providing it does not possess a high degree of the para or mucoid characteristics, it is impossible to identify strains of *B. abortus* by means of the agglutinin absorption test with any degree of certainty.

Incidence of Brucella abortus in the fetal membranes of full-time, reacting cows, R. GWATKIN (*Cornell Vet.*, *22* (*1932*), *No. 1, pp. 62–66*).—In examinations made of the placental membranes of 34 full-time positive cows (1:100 and over) and 2 suspicious cows (1:50) by cultural methods and animal inoculation, *B.* abortus was recovered from the membranes of 5 of the positive animals and from neither of the suspicious ones. This organism was recovered from the milk of 18 of the 32 positive animals that were examined, but from neither of the suspicious animals. The milk of those animals with a titer of 1:500 and above showed a higher incidence of infection, but cows with a titer of only 1:100 had infected milk and also infected placental membranes. The number of organisms in the placental membranes of full-term, positive cows was small compared to the number in the majority of aborted fetal membranes. The titer of the serum was no indication as to the presence or absence of infection in the udder or placental membranes.

Morphology and evolution of the microbes of pleuropneumonia of bovines and contagious agalaxy of sheep and goats [trans. title], W. WROBLEWSKI (*Ann. Inst. Pasteur*, *47* (*1931*), *No. 1, pp. 94–115, pls. 2*).—The author reports upon studies of the causative agent of bovine pleuropneumonia and that of contagious agalaxy. They are filter passers in all stages of their development, both passing Chamberland L¹ and L¹ ᵇⁱˢ and Berkefeld N filters.

A note on the intradermal injection of Streptococcus epidemicus filtrate in animals, R. GRAHAM, F. THORP, JR., and S. E. PARK (*Cornell Vet.*, *22* (*1932*), *No. 1, pp. 56–61*).—A cow that was exposed to *S. epidemicus* by smearing a culture over the ends of the two fore teats developed a clinical mastitis in one quarter. The inflammatory process and bacterial infection were passive in character. Local reactions did not occur following the intradermal injection of *S. epidemicus* filtrate into three cows, a pig, and a calf.

[Contributions on animal pathology] (*Amer. Assoc. Med. Milk Comns.* [*etc.*] *Proc.*, *25* (*1931*), *pp. 86–88, 231–245, 246–256*).—The contributions relating to animal pathology are as follows: The Fermentation of Organic Acids by Brucella, by E. Leifson; The Diagnosis and Control of Mastitis, by D. H. Udall and S. D. Johnson; and The Control of Bang's Disease, or Contagious Abortion, from the Standpoint of the Producer of Certified Milk, by C. P. Fitch.

[Report of work in animal pathology and parasitology] (*Louisiana Stas. [Bien.] Rpt. 1930–31, pp. 112–115, 120*).—Brief accounts are given of work not previously noted with anaplasmosis and blindness in chickens, by H. Morris; with coccidiosis in fowls, by R. L. Mayhew; and with crewood oil, a southern by-product of wood distillation, for control of mites in the poultry house, by C. W. Upp.

Report of the veterinary service, J. M. Smith (*Palestine Dept. Agr. and Forests Rpt. 1927–1930, pp. 12–22*).—Under the heading of animal diseases (pp. 15–21), the more important infectious diseases of livestock are considered. Particular attention is given to piroplasmosis and anaplasmosis in cattle, sheep, and goats, with a list of 12 species and 1 variety of ticks met with in Palestine.

The common diseases of dairy cattle [trans. title], F. M. Gabriel (*Min. Agr. Prov. Québec Bul. 107 (1931), pp. 72, figs. 27*).—A brief practical account of the common affections of dairy cattle.

[Contributions on infections of the bovine udder] (*Internatl. Assoc. Dairy and Milk Insp. Ann. Rpt., 20 (1931), pp. 223–250, 269–312*).—The contributions relating to infections of the bovine udder are as follows: Bang's Disease in Relation to Milk, by R. Gwatkin (pp. 223–230); *Brucella abortus* Infection of the Udder, by C. A. Mitchell (pp. 231–241); The Excretion of Tubercle Bacilli from the Udder, by E. A. Watson (pp. 242–250); Relation of the Streptococcus to Milk-Borne Infection, by J. H. Brown (pp. 269–276); Diagnosis and Control of Mastitis, by D. H. Udall (pp. 277–286); Observations on Bovine Mastitis, by H. B. Switzer (pp. 286–291); Some Results of Three Years of Mastitis Studies in the Province of Quebec, by J. M. Rosell (pp. 292–308); and Discussion of Papers on Mastitis, by R. S. Craig (pp. 309–312).

The relation of nutrition to contagious cattle abortion, E. B. Hart, F. B. Hadley, and G. C. Humphrey (*Wisconsin Sta. Research Bul. 112 (1932), pp. 45, figs. 6*).—Experimental work with a herd of dairy cattle fed quite dissimilar rations and purposely exposed to several strains of *Brucella abortus* of bovine origin over a period of 5 years is reported upon. The animals were closely observed and data recorded daily throughout the entire period. The following definite conlusions were arrived at:

"A high plane of nutrition, involving the feeding of alfalfa hay, minerals, cod-liver oil, and iodized salt, had no effect whatever in developing a resistance in cattle to infection with *B. abortus*, as compared with a ration of lower protein content, supplemented with common salt, but no other mineral. In a herd of 22 animals on the 'good' ration and 22 on the 'poor' ration, purposely exposed to the microorganism responsible for contagious abortion, 11 of the former aborted their calves as compared with 8 of the latter. However, it is advisable for Wisconsin dairymen to feed iodized salt as a precautionary measure against goiter in calves, even though iodine has no value in preventing abortion.

"The poor ration, unsupplemented with minerals except common salt, under our system of management maintained the animals and their milk productions nearly as well as the good ration which was supplemented with bone meal, cod-liver oil, and iodized salt, and which carried a considerably higher level of protein. The poor ration, under our system of feeding and management, maintained the mineral content of the skeletons up to the beginning of the fourth lactation period at as high a level as did the good ration; presumably the animals were in the same status in respect to their skeletons at the beginning of preceding lactations.

"Feeding cod-liver oil to dairy cattle as a source of vitamin D is inadvisable because it depresses milk fat production. The cows on the poor ration appar-

ently had the ability to adjust themselves to a much lower lime intake than has been thought possible, i. e., the efficiency of lime utilization increased as the level of lime in the ration decreased.

"The experiment demonstrated that a herd can be assembled and kept reasonably free from contagious abortion if the foundation animals are bought as blood-tested calves from clean herds, segregated, and retested from time to time."

A study of bovine blood, urine, and feces for the presence of Bact. abortus Bang, C. P. Fitch, L. M. Bishop, and W. L. Boyd (*Soc. Expt. Biol. and Med. Proc., 29 (1932), No. 5, pp. 555–558*).—Studies conducted at the Minnesota Experiment Station indicate that *B. abortus* is not present in large numbers in the blood stream of infected cows. This organism was isolated from 4 of the 123 samples of blood, 2 of the 4 samples found positive having been taken from a single animal. The longest period of time after calving or aborting that *B. abortus* was isolated from urine was 12 days, or within the period of time that *B. abortus* has been isolated from vaginal discharges (E. S. R., 63, p. 772). It is evident that it would be impossible to be absolutely certain that the organisms did not get into the urine through its contact with the vaginal and uterine discharges. Two positive feces inoculations were obtained from two different animals. The samples were collected 1 and 3 days after aborting. This small number of positive results indicates that there is not an active infection in the intestinal tract, but that the presence of the organism in the feces is probably due to eating materials contaminated with *B. abortus*.

Guinea pig inoculation was much more satisfactory than cultural procedures as a means of isolating the organism.

The elimination of Bact. abortus in the milk of cows, H. L. Gilman (*N. Y. State Vet. Col. Rpt. 1929–30, pp. 142–156*).—In the course of the work here reported upon, the milk from all quarters of 34 cattle was examined for agglutinin content and inoculated into guinea pigs for evidence of *Bacterium abortus* infection. Nine animals were used twice, making a total of 43. This organism was not recovered from milk showing agglutinins under 1:80, nor from the milk of an animal with a blood titer lower than 1:320. *B. abortus* was recovered from 53.8 per cent of the milk from quarters showing agglutinins in dilutions of 1:80 or higher. It is tentatively assumed by the author that quarters showing agglutinins at 1:80 or above are actively infected with *B. abortus* and may eliminate the organism at any time. Quarters showing agglutinins under 1:80 only in rare instances contain or eliminate the organism.

A list is given of 36 references to the literature.

The control of Bang's disease in range animals, A. M. McCapes (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 2, pp. 187–193*).—This contribution, in the preparation of which the author was assisted by veterinarians widely distributed in the cattle-grazing range territory, deals with the extent of the infection, its control, and State laws and regulations concerning the disease.

Studies on East Coast fever.—I, The life cycle of the parasite in ticks, E. V. Cowdry and A. W. Ham (*Parasitology, 24 (1932), No. 1, pp. 1–49, pls. 7, fig. 1*).—A detailed account of studies of the life cycle of *Theileria parva* in *Rhipicephalus appendiculatus*, presented in connection with a list of 32 references to the literature.

Milk fever: Paresis puerperalis in the light of recent investigations—experiments with calcium therapy, H. Stålfors and N. Lagerlöf (*Cornell Vet., 22 (1932), No. 1, pp. 29–40*).—Studies conducted in Sweden by the authors are here reported upon. The work at the ambulatory clinic has led to the recommendation of inflation of the udder instead of the calcium chloride treat-

ment. It is pointed out that in difficult cases with relapse calcium therapy will be of value if combined with inflation of the udder.

Rinderpest in Indo-China, H. Jacotot (*La Peste Bovine en Indochine. Saigon: Inst. Pasteur Indochine, 1931, pp. 71*).—The author deals with the history, epidemiology, nature of the disease, and the virus of rinderpest as it occurs in Indo-China.

On the rôle of leeches in the transmission of rinderpest [trans. title], G. Curasson and L. Didier (*Bul. Soc. Path. Expt., 25 (1932), No. 1, pp. 44, 45*).—Studies in the Sudan indicate that the virus of rinderpest is not conserved in the blood ingested by leeches (*Limnatis nilotica*), and that they do not play any part in the dissemination of the disease.

An epizoological study of shipping fever in Kansas, H. Farley (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 2, pp. 165–171*).—In an epizoological study of shipping fever by the Kansas Experiment Station, losses among vaccinated cattle involved were found to be higher than among those not vaccinated. The disease was more severe in cold, wet weather, and the increase of loss during bad weather was greater among the vaccinated than with untreated animals. The weight of the animals and losses from shipping fever were not correlated. Heavy animals seemed to be as susceptible as 200-lb. calves. Losses were heavier in all weights of vaccinated animals than in the unvaccinated animals. Vaccination of animals at the farm after shipment was followed by a slightly greater loss than when vaccination was practiced at the yards. Vaccination of cattle at the farm after they had been vaccinated at the yards resulted in very heavy losses (10 and 11 per cent). Treatment of a small number of cattle with antihemorrhagic septicemia serum resulted in a reduction of losses to a very small figure.

Preliminary bacteriological report on shipping fever, J. P. Scott and H. Farley (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 2, pp 173–186*).—In studies conducted at the Kansas Experiment Station, *Pasteurella boviseptica* was isolated in 80 per cent of the cases of shipping fever where autopsies were made. In 60 per cent of the 23 cases examined, *P. boviseptica* was associated with either colon type organisms or with members of the Alcaligines group, usually *A. bronchisepticus*. Immunization of guinea pigs and rabbits by broth and agar cultures showed that *P. boviseptica* had only very slight immunizing powers. A comparison of the agglutination titer produced in immunized rabbits and their survival following test injections showed that there was no direct or constant relationship between the degree of protection and the agglutination titer. A comparison of one virulent culture and an avirulent culture showed that there was no direct relationship between the virulence of a culture and its protective properties. The avirulent culture protected a greater number of rabbits than the virulent culture.

Rabbits and guinea pigs varied from 3 to 8 times in their resistance to injections of *P. boviseptica*. Calves were killed by intravenous injections of *P. boviseptica* and colon organisms. Full-fed calves were more susceptible to subcutaneous injections of *P. boviseptica* than calves which were not given hay or grain for 24 hours before an injection. Fermentation tests of 13 strains of *P. boviseptica* show that these organisms produce acid in glucose, sucrose, galactose, levulose, and mannite.

Bacteriology of skin lesions of tuberculin reacting cattle, L. L. Daines and H. Austin (*Soc. Expt. Biol. and Med. Proc., 29 (1931), No. 1, pp. 3–5*).—This is a preliminary report on the bacteriology of 189 cases of so-called skin tuberculosis of cattle studied in Utah.

More than 90 per cent of the lesions studied in the series came from animals which had given a positive tuberculin reaction. Only 1 of the 189 skin lesions

yielded a typical *Mycobacterium tuberculosis* (bovine type), which came from an animal that appeared to have generalized bovine tuberculosis. A careful search of these skin lesions revealed the presence in all of them of acid-fast rods, as well as one or more forms of acid-fast or nonacid-fast coccoid, diphtheroid, or streptococcoid organisms or branching filaments. It is considered probable that these are all different stages or forms of a pleomorphic organism. All but one of the 189 skin lesions, as well as organs from several no-lesion reactors yielded in culture one or more forms of markedly pleomorphic, facultative acid-fast, Gram-positive organisms. Of these, a few strains—the only ones tried up to the present—produced fairly constant results when inoculated into male or pregnant female guinea pigs.

These results are considered more nearly typical of the Preisz-Nocard bacillus (*Corynebacterium ovis*) than of any other known organism. Morphologically and physiologically these organisms resemble very closely not only *C. ovis* but also the Actinomyces described by E. L. Walker as the cause of human leprosy[2] and by E. L. Walker and M. A. Sweeney as the cause of rat leprosy.[3] It is considered possible "that we have in these organisms a new, undescribed species. The possibility that these pleomorphic forms may be stages in the life cycle of a true, attenuated, mammalian tubercle bacillus must be kept in mind. Because of the constant occurrence of these forms, practically always in pure culture, in skin lesions of tuberculin-reacting cattle and in the organs of no-lesion reactors, we are led to believe that they are the cause of nearly all of the skin lesions and of the tuberculin hypersensitiveness of most of the reactors in Utah. If these organisms are finally shown to be the cause of the usual skin lesions of tuberculin-reacting cattle, their cultural reactions and their effects on guinea pigs may offer a means of definite early diagnosis and probably make unnecessary the slaughter of large numbers of cattle."

Studies on B. C. G. vaccine.—II, Non-virulence and resistance in newborn calves, A. C. Rankin, J. J. Ower, R. M. Shaw, P. R. Talbot, and H. M. Vango (*Canad. Jour. Research, 6 (1932), No. 2, pp. 177–191*).—In continuing their studies (E. S. R., 65, p. 571), the authors found that bovines fed B. C. G. shortly after birth do not show tuberculous lesions nor any evidence of tuberculous infection at autopsy two years after such vaccination. This is demonstrated in animals vaccinated by mouth with suitable controls. Unvaccinated unprotected controls living closely in contact with these vaccinated animals were at the end of the same period quite free from tuberculous infection. Such evidence supports the contention that there is no return of virulence in B. C. G. in the animal body, and that, therefore, vaccinated animals are not a source of danger to unprotected animals.

A problem in the coagulation of the blood, L. M. Roderick (*Amer. Jour. Physiol., 96 (1931), No. 2, pp. 413–425, fig. 1*).—This paper from the North Dakota Experiment Station deals with a consideration of the alterations in the blood of cattle following the feeding of damaged sweetclover hay and silage which are concerned in the coagulation process.

The analyses of the blood of a number of animals fed such hay indicated that there may be some depression in blood fibrinogen, but the differences were within the range of probable error. The delayed coagulation involved a reduction in the prothrombin, and the reduction paralleled the delay in coagulating time. There were no indications that the delay was due to an increase of an inhibitory principle of the nature of heparin or antithrombin, neither was it caused by nor did it involve a deficiency in calcium metabolism. The pro-

[2] Jour. Prev. Med., 3 (1929), No. 3, pp. 167–195, pl. 1.
[3] Jour. Prev. Med., 3 (1929), No. 4, pp. 325–333.

gressive decrease in available prothrombin appeared to be independent of the number of platelets present, which remained about level until hemorrhage occurred. The intravenous injection of freshly defibrinated normal bovine blood to animals showing the effects of serious hemorrhage brought about a large percentage of recoveries.

The occurrence of Cooperia oncophora and Nematodirus helvetianus in calves, E. A. TUNNICLIFF (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 2, pp. 250, 251*).—A massive infestation of small strongyles in the duodenum and abomasum, with the cecum, lower small intestine, and rectum practically free of parasites, is reported by the author to have caused the death of 2 of 15 affected calves among some 500 on a ranch in northwestern Montana. The symptoms of the infestation by *C. oncophora* and *N. helvetianus* were indistinguishable from those of coccidiosis observed in calves and yearlings, and a light infestation of coccidia was present. Just how much of a factor the coccidia were and whether the worms or the coccidia were the primary cause was not determined.

Studies on the cellular changes in pigs' blood during the development of hog cholera, S. SHU (*N. Y. State Vet. Col. Rpt. 1929–30, pp. 124–136, pls. 2*).—The author finds that leucopenia appears 72 hours, or earlier, after the cholera infection and at least 24 hours prior to any manifestation of clinical symptoms. The extent of leucopenia does not run absolutely parallel with the febrile reaction or clinical symptoms, especially in the later stages of the disease. Decrease in number of red corpuscles is not pronounced at the onset, but progressive. In the later stage this condition is often severe and striking. Eosinopenia and basopenia are present throughout the entire course, and relative neutrophilia with relative lymphopenia are present in every typical case. Some are moderate while others are very extreme. Nuclear index according to Schilling's classification applies well to the morphological changes in neutrophiles. The shift to the young forms is noted in every case. This phenomenon is very marked in the later stages, sometimes resulting in the total absence of segmented nuclears. Whenever the myelocytes and juveniles appear in relative high percentage in the peripheral circulation the prognosis for the infected animal can be considered very grave.

The technic of making smear and staining, though seemingly simple and easy, should be carefully carried out, especially in the later stages of cholera.

Histological studies on hog cholera, C. B. CAIN and O. SEIFRIED (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 2, pp. 225–228*).—In this report of histological studies the authors emphasize the fact that injuries of the blood vessels constitute the primary lesions in the lymph nodes, kidneys, and other organs, and that changes in other structures arise as a result of these lesions.

Experiments on attenuating hog cholera virus with chloroform, S. SHU (*N. Y. State Vet. Col. Rpt. 1929–30, pp. 167–173*).—In studies conducted a 0.75 per cent chloroform solution had little attenuating effect on the virus, and the vaccine containing 0.75 per cent chloroform was still virulent at the end of 5 weeks. Vaccine containing 1.5 per cent chloroform, in one series, conferred considerable immunity to two susceptible pigs when injected, respectively, 2 and 8 weeks after it was made. These inoculated pigs proved to be resistant to virus injections, though both showed mild reactions in varying degree. In another series vaccine containing 1.5 per cent chloroform, after being made 48 hours and 2 weeks, produced fatal cases of subacute cholera. When it was 5 weeks old it was again injected into a pig, which showed a severe reaction but recovered after 9 days of illness. Vaccine containing 2 per cent chloroform, after 1 week, produced a fatal case of subacute cholera. Vaccine containing 4 per cent chloroform and ethyl alcohol, respectively, when 1 week of age, caused a fatal case of subacute cholera. After 8 weeks, when again injected

into a pig, the animal had a severe reaction but lived for 3 weeks. At that time 2 c c of stock virus was injected as a test of immunity. The animal died 4 days after this trial injection of virus.

County-wide eradication of equine parasites, J. B. Bryant (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 2, pp. 218–219*).—This is a discussion of the subject as related to the horse botfly.

Epidemics among sledge dogs in the Canadian Arctic and their relation to disease in the arctic fox, C. Elton (*Canad. Jour. Research, 5 (1931), No. 6, pp. 673–692, fig. 1*).—A report is made of an inquiry by the Hudson's Bay Company into the origin and spread of a serious disease, resembling epidemic encephalitis of silver foxes, which periodically destroys large numbers of sledge dogs in the arctic and subarctic regions of Canada. It appears that a similar disease occurs in the arctic fox and is associated with an important four-year cycle in the numbers of the fox, which may thus form a permanent reservoir for the disease organism or organisms. General forecasting of this fox cycle is said to be possible, and is dependent on knowledge of the lemming cycle in the arctic and associated climatic phenomena.

Parasites of ranch foxes and their treatment, K. B. Hanson (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 2, pp. 202–212*).—In this summary of information on parasites of importance in ranch foxes both internal and external forms and means of control are considered.

[Report of work in avian pathology] (*Rhode Island Sta. Rpt. [1931], pp. 47–49*).—Brief statements are made of work during the year (E. S. R., 65, p. 572) with fowl pox, coccidiosis of poultry, and blackhead of turkeys (E. S. R., 66, p. 775).

Bacillary white diarrhoea, or pullorum infection, in adult hens, T. van Heelsbergen (*Vet. Jour., 88 (1932), No. 2, pp. 60–65*).—An account of the occurrence of this disease in the adult fowl, of salpingitis, and means of prevention.

The hatchability of eggs and the livability of chicks of pullorum-infected and non-infected hens, H. C. H. Kernkamp (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 2, pp. 229–235*).—In studies conducted at the Minnesota Experiment Station, it was found that hens free from pullorum disease produced more eggs than those affected with the disease and that eggs from pullorum-diseased hens were no less fertile than those produced by hens free from the disease. "The results indicate that at least one of the causes for the arrest of development of the embryo is *S[almonella] pullorum*, since the percentage of fertile eggs having dead germs was greater in the reactor hens than in the nonreactor and more of the eggs examined from the former group contained organisms (*S. pullorum*) than those of the latter group. The statistics on the numbers of chicks hatched and the number raised to maturity favor slightly the non-infected hens. The losses from pullorum disease in chicks hatched from infected hens is much greater than from the noninfected ones. From infected hens the loss was 33.3 per cent, from noninfected 3.8 per cent. The deaths of chicks from causes other than pullorum disease were in excess of those produced by *S. pullorum*. Coccidiosis and colon infections were responsible for the greater number."

A study of the intestinal flora of chicks affected with pullorum disease, M. W. Emmel (*Jour. Infect. Diseases, 50 (1932), No. 3, pp. 213–217*).—In a systematic study in Alabama of the intestinal contents of 30 pullorum-positive chicks, colon organisms constituted an average of 32.35, 38.02, and 63.35 per cent of the bacterial flora of the duodenum, middle portion, and cloaca, respectively. In the same study *Salmonella pullorum* constituted an average of 47.26, 47.61, and 19.63 per cent of the bacterial flora of the duodenum, middle portion, and cloaca, respectively. The inoculation of 24-hour broth cultures of

S. pullorum with colon organisms resulted in a reduction in the number of *S. pullorum* per cubic centimeter from 189,600,000 to 32,000,000 after 24 hours' incubation. The hypothesis is advanced that a colon flora is beneficial in the intestinal tract of the chick. In 13 of 15 chicks that recovered from pullorum disease, *S. pullorum* persisted in the feces for 1 week, in 8 chicks for 2 weeks, in 3 chicks for 3 weeks, and in 1 chick for 5 weeks after the climax of the outbreak.

Coccidiosis in gallinaceous birds.—II. A comparative study of species of Eimeria of the chicken, E. E. Tyzzer, H. Theiler, and E. E. Jones (*Amer. Jour. Hyg., 15 (1932), No. 2, pp. 319–393, pls. 4, fig. 1*).—In this second contribution on the species of Eimeria occurring in the common fowl (E. S. R., 62, p. 266), the authors deal particularly with studies of two species of coccidia, *E. necatrix* John. and *E. praecox* John., which, it is pointed out, were discovered independently by Johnson at the Oregon Experiment Station (E. S. R., 64, p. 377) and by the authors at the Medical School of Harvard University.

E. necatrix has been found associated with by far the most serious form of coccidiosis that has come to the authors' attention, producing a disease which is commonly fatal. The acute form, produced by heavy dosage of oocysts, is characterized by intestinal stasis in association with hemorrhage and exudation into the small intestine, and death occurs from the fifth to the seventh day of infection. There is loss of appetite, weakness, and anemia from acute hemorrhage, the cecal contents become inspissated while the crop becomes distended with water. The middle portion of the small intestine usually shows the greatest intensity of infection. Well-defined, rounded, whitish spots representing colonies of large schizonts are visible through the muscular coats of the intestine and constitute the specific lesions of the disease. Hemorrhage which commences in the centers of these lesions may completely obliterate them. The intestinal tube becomes distended with hemorrhage and fibrinous exudate, and its wall may become almost gangrenous. Acute peritonitis occurs commonly in this infection. In continued lighter infections wasting may occur. The evolution of the pathological processes found in association with the infection has been followed step by step by the microscopical study of the tissues of birds killed at appropriate intervals.

The development of *E. necatrix* was followed, the stages resembling those of *E. tenella*, but distinguishing morphological features were found in the sporozoites and in the merozoites, while the oocysts of the former are also somewhat smaller. *E. necatrix* passes through two schizogonous cycles in the small intestine, and completes its development usually in the ceca, to a slight extent in the large intestine, and in exceptional cases late stages may be found in the lower small intestine. Schizogony is continued through more generations than in *E. tenella*, and the infection is more prolonged. Oocysts are produced more sparingly but over a longer period. Few oocysts are produced in the acute form of the disease, but light unrecognized infections in apparently normal birds may furnish considerable numbers.

A study of the second species, *E. praecox*, shows that it elicits no appreciable inflammatory reaction even in heavy infection, so that it may be regarded as practically innocuous so far as direct injury to the tissue is concerned. Infections with this species are short lived, immunity becoming promptly established. Its development is said by the authors to be the most rapid of any avian Eimeria thus far encountered, and oocysts appear before the end of the fourth day.

Experimental methods are outlined for eliminating all possibility of accidental infection or of reinfection, for following the course of a single infection, for detecting the presence of small numbers of viable oocysts in fecal discharges

or other material, and for isolating a pure strain of *E. necatrix* from mixed infections with species developing in the small intestine. It was found that the protection resulting from light infections of *E. necatrix* is less than that afforded by heavy ones. Through successive feedings of infective material it is possible to protect the host against injury even when fed doses that are invariably fatal to control birds. Through histological study, it was found that in thoroughly immunized birds most of the sporozoites are destroyed after invading the gland cells by the failure of the latter to respond in such a way as to favor the growth of the parasite. No evidence has been obtained of any protective mechanism attributable to humoral response. In birds thoroughly immunized against *E. necatrix*, immunity is found to continue for some time after oocysts have disappeared from the discharges and has been demonstrated at the end of a period of 14 days in the absence of any possible exposure to infection. It was not found possible to demonstrate any degree of cross immunity between *E. tenella* and *E. necatrix*. No remedy has been found that will prevent infection from an experimental feeding of sporulated oocysts.

A list is given of 19 references to the literature.

The influence of diet on the development of experimental coccidiosis in chickens kept under sanitary conditions, E. A. Allen (*Amer. Jour. Hyg., 15 (1932), No. 1, pp. 163–185, figs. 2*).—This preliminary report of experiments aimed at the determination of the possible value of a well-balanced ration rich in vitamins in enabling chickens to survive the most critical period of the cecal type of coccidiosis is presented in connection with a list of 13 references to the literature.

The author found "an indicated correlation between a high-protein and a high-vitamin diet and the production among chickens infected with *Eimeria tenella* of a form of coccidiosis which is subacute or chronic, with a relatively low daily production of oocysts, a markedly flattened peak of oocyst production on the second day after oocysts appeared, a lessened amount of hemorrhage which is also of shorter duration, a low mortality rate, and a failure to regain good physical conditions by the eighteenth day after oocysts appear, this latter presumably being associated with a continued oocyst production in this more or less chronic form of coccidiosis."

How to control coccidiosis, L. E. Weaver (*Amer. Agr., 129 (1932), No. 15, pp. 3, 13, 14, fig. 1*).—In examinations made during the year 1931 by the New York State Veterinary College of 258 State flocks composed of chicks under 3 months of age, 11 per cent were found to have acute or cecal coccidiosis and 8 per cent chronic or duodenal coccidiosis. In examinations of 2,752 older birds in 566 flocks, 22 per cent showed the duodenal type of coccidiosis.

The effect of radiation on the resistance of chickens to fowl cholera, D. D. Donahue (*Amer. Jour. Hyg., 15 (1932), No. 1, pp. 206–231, figs. 3*).—In the studies here reported over 500 chickens were exposed to various sources of radiation and then infected with *Pasteurella avicida*, using subcutaneous or intranasal inoculations.

"Daily exposures over a period of 1 month to a quartz mercury arc giving a total dose of 29 to 49 ZnS units, or to a General Electric sun lamp (type S–1) giving a total dose of 63 to 189 ZnS units, slightly decreased the resistance of young chickens to subsequent subcutaneous infection with *P. avicida*. Daily exposure to a quartz mercury arc giving total doses of 54 to 203 ZnS units increased the resistance of young chickens to subsequent intranasal infection with *P. avicida*. Daily exposures to a G. E. sun lamp giving total doses from 54 to 82 ZnS units had no effect on the resistance of month-old chickens to subsequent intranasal infection with *P. avicida*. Chickens which were exposed

to X-rays for 15 to 30 minutes and inoculated 1 hour after exposure were less resistant than the controls."

Inheritance of resistance to fowl paralysis (neurolymphomatosis gallinarum).—I, *Differences in susceptibility*, V. S. ASMUNDSON and J. BIELY (*Canad. Jour. Research, 6 (1932), No. 2, pp. 171–176*).—The authors' studies of the incidence of paralysis and lymphomatous tumors in a flock of 542 pullets of six different breeds indicate the presence of both in 14 out of 52 paralyzed pullets, while an additional 22 had tumors but were not paralyzed. The association of paralysis and tumors may have been due to chance. The evidence presented, while not conclusive, points to the inheritance of resistance to paralysis. This is indicated particularly by differences in the proportion of paralyzed pullets in different breeds and absence of paralysis among the progeny of certain males and in certain large families. The data obtained point to a simple mode of inheritance.

A vaccine for the prevention of fowl pox, M. CRAWFORD (*Trop. Agr. [Ceylon], 78 (1932), No. 1, pp. 18–20*).—The author has found the use of a pigeon pox vaccine to be well adapted to Ceylon and that it can be recommended to poultry breeders.

Pigeon-pox virus and immunization against chicken-pox in fowls, E. P. JOHNSON (*North Amer. Vet., 13 (1932), No. 3, pp. 47, 48*).—In experiments conducted at the Virginia Experiment Station it was found that the pigeon pox virus vaccine protected against fowl pox under natural conditions for at least one year.

Fowl-pox vaccination at various ages and its effect upon normal growth gains, R. E. LUBBEHUSEN and D. P. EHLERS (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 2, pp. 236–249, figs. 5*).—The work in Pennsylvania here reported led to the recommendation that birds should be vaccinated when between 30 and 90 days of age. The systemic reaction incident to vaccination during this period does not appreciably affect normal growth and development. It was found that the vaccination of birds between 90 and 120 days of age produced inhibition in normal weight gains. "In normal birds this period of inhibition is transient and exerts no visible influence on future normal development. Vaccination of birds older than 120 days results in a distinct postvaccination shock. Under certain conditions this systemic reaction may be a predisposing factor to impaired health. In birds 30 days of age or older, a successful vaccination take at the point of inoculation will produce an adequate protective immunity against natural infection with fowl pox."

Appearance of laryngotracheitis of the fowl in Germany [trans. title], LERCHE (*Berlin. Tierärztl. Wchnschr., 48 (1932), No. 10, pp. 145–150, figs. 7*).—An account is given of laryngotracheitis of the fowl in a malignant form which was observed by the author in two flocks, the first cases to be observed in Germany.

Studies on the nature of the agent transmitting leucosis of fowls, I–III (*Jour. Expt. Med., 55 (1932), No. 3, pp. 465–478, 479–493, 495–504*).—The three contributions on leucosis of fowls presented are as follows: Its Concentration in Blood Cells and Plasma and Relation to the Incubation Period, by J. Furth et al.; Filtration of Leucemic Plasma, by J. Furth, H. K. Miller, and C. Breedis; and Resistance to Desiccation, to Glycerin, to Freezing and Thawing; Survival at Ice Box and Incubator Temperatures, by J. Furth et al.

The susceptibility of pheasants and a pheasant bantam cross to the virus of infectious bronchitis, C. B. HUDSON and F. R. BEAUDETTE (*Cornell Vet., 22 (1932), No. 1, pp. 70–74*).—In a study at the New Jersey Experiment Stations, it was found that the virus of infectious laryngotracheitis produced the clinical

disease in pheasants and in a pheasant-bantam cross. It appears that the passage of the virus through these hosts does not alter its virulence for chicks, and when passed through a pheasant-bantam cross is virulent for a pheasant. It was found that a pheasant may take the disease when exposed to infection.

Progress in western duck sickness studies, E. R. KALMBACH (*Science, 75 (1932), No. 1932, pp. 57, 58*).—In reporting upon the progress of studies of western duck sickness (E. S. R., 64, p. 776), it is stated that in at least 20 different instances during the summer of 1931 the botulism toxin was demonstrated either through feeding or inoculation of experimental birds, mainly pigeons, with material obtained directly from field sources. Necessary toxin-antitoxin tests were made on every occasion, definitely identifying the toxin as that originating from *Clostridium botulinum*, type C, of Bengston.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations at the Louisiana Stations], H. T. BARR, A. H. MEYER, and W. WHIPPLE (*Louisiana Stas. [Bien.] Rpt. 1930–31, pp. 68–73*).—The progress results of studies are reported on deficiencies of agricultural implements as applied to sugarcane culture, producing corn and soybeans with mechanical power, the possibility of storing hay by chopping and elevating, subsoiling of cotton land, draft of cane wagons, artificial curing of hay, and cane milling and freezing.

Report of the fourth biennial conference of the Western Irrigation and Drainage Research Association (*[Tucson, Ariz.], 1931, pp. [2]+36*).—The proceedings of the conference held at Tucson, Ariz., in July, 1931, are presented, including special papers on The Permanent Wilting Percentage in Relation to Irrigation Experiments, by A. H. Hendrickson and F. J. Veihmeyer (pp. 3–7); Coordination of Research Concerning the Flow of Water in Soils, by O. W. Israelsen (pp. 7a–13); Institutional Irrigation and Drainage Relationships, by W. A. Hutchins (pp. 17–20); Adjustments in Agricultural Research, by P. V. Cardon (pp. 22–25); Some Elements of the Economic Design of Wells and Pumping Plants, by M. R. Lewis (pp. 28–32); and Irrigation vs. Dry Farming under the Ditch, by H. E. Murdock (pp. 33–35).

Efficiencies in irrigation, O. W. ISRAELSEN (*Utah Acad. Sci. Proc., 8 (1930–1931), pp. 40–43*).—In a contribution from the Utah Experiment Station, an analysis is given of the measurement of efficiencies in irrigation with particular reference to the efficiency of water application, conveyance and delivery, consumptive use efficiency, and irrigation efficiency. It appears that irrigation efficiency is influenced by the efficiency of application, conveyance and delivery, and consumptive use.

Methods of alleviating water shortages on irrigation projects, G. D. CLYDE (*Agr. Engin., 13 (1932), No. 2, pp. 37–41, fig. 1*).—In a contribution from the Utah Experiment Station, a summary is given of some of the more important methods developed of alleviating water shortages with particular reference to the management of watersheds, the forecasting of water supplies, the development of underground water supplies by pumping, the artificial replenishing of ground water supplies, improved distribution and application of irrigation water, and the practice of fall and winter irrigation.

Underdrainage as protection of crops against drought damage, J. H. NEAL (*Agr. Engin., 13 (1932), No. 3, pp. 64–66, figs. 2*).—The results of studies in progress at the Minnesota Experiment Station are presented.

It has been found that the volume of capillary pore space in clay soils is from 35 to 55 per cent of the total volume, while that of the noncapillary pore space is not over 5 to 10 per cent of the total volume. Both are very finely

divided, and the rate of movement of excess water through clay soil is therefore very slow, approaching that of capillary movement. It also has been found that the saturated capacity of clay soils ranges from 5 to 7 in. per foot of depth of soil, while the capillary capacity ranges from 3.5 to 6.5 in., the difference being the amount of free water to drain away.

It was found that if the surface flood water can be removed quickly and the excess moisture in the top 2 or 3 ft. of soil can be removed early enough in the growing season to permit deep root penetration, the practical bearing of the facts relative to pore space and soil water movement on crop growth is that waterlogging is checked, if not prevented, and sufficient capillary water is held to carry plants over dry spells.

Drainage of land overlying an artesian basin, O. W. Israelsen (*Utah Acad. Sci. Proc., 8 (1930–1931), pp. 35–37*).—In a contribution from the Utah Experiment Station, the organization of studies of the drainage and reclamation of certain lands overlying an artesian basin, which are being conducted in cooperation with the U. S. D. A. Bureau of Agricultural Engineering, is described. Data from pumping are briefly reported showing a substantial influence of pumping on water pressures. It also was found that the water pumped to provide drainage may be used advantageously for irrigation, thus reducing the costs directly chargeable to drainage.

Subsidence and durability of peaty lands, W. L. Powers (*Agr. Engin., 13 (1932), No. 3, pp. 71, 72*).—Results of studies in progress at the Oregon Experiment Station are briefly reported, and a summary of experience elsewhere on the subject is included.

The conclusion is drawn that the settlement of peat is greater during the first years following drainage, and that the amount of subsidence will depend on the depth of drainage as well as on the depth and composition of the peat. Also erosion by wind or water may cause loss of dry peat. The organic colloids shrink greatly upon drying and seem to be partly irreversible. It has been found that controlled fires, moisture, temperature, aeration, reaction, and nutrients required by decomposition microorganisms afford means of regulating the decomposition of peat. Drainage should be designed to provide for vertical shrinkage of approximately 33 per cent.

Coordination of research concerning the flow of water in soils, O. W. Israelsen (*Agr. Engin., 12 (1931), No. 12, pp. 435–438*).—In a contribution from the Utah Experiment Station, a technical description is given of the potential function and the relationship of the gradient of the potential to the slope of the hydraulic grade line with reference to the flow of water in soils. The analysis is restricted to a consideration of one-dimensional steady flow wherein the same quantity of water flows past a series of points along the channel.

The conclusion is drawn that coordination in usages and in definitions relating to the flow of water in soils is urgently needed, and that no attempt should be made to modify or discontinue the use of the transmission constant for flow in saturated soils as developed by Slichter. It is also deemed desirable to agree on definitions and usages in the study of capillary water flow.

A brief list of references to the publications consulted in preparing this analysis is included.

The mechanical manipulation of soil as it affects structure, J. A. Slipher (*Agr. Engin., 13 (1932), No. 1, pp. 7–10, figs. 3*).—In a contribution from the Ohio State University, an analysis is given of the basic features of soil dynamics as they affect soil structure and moisture conservation. It is emphasized that the intermediate objective of soil manipulation is structure making, and that structure in turn must be so designed as to properly serve a biological end and at the same time conserve the soil body intact.

The basic needs of tillage are enumerated as a model structure profile, a standard root-bed profile for each crop, a measuring stick for soil structure, an optimum moisture index and calendar for tillage, the placement of trash in the structure profile, and a model surface conformation for each season and crop.

Builders' materials, R. F. B. GRUNDY (*London and New York: Longmans, Green & Co., 1930, pp. X+240, figs. 91*).—This is a handbook of information.

Characteristics of alloyed cast-iron, F. W. SHIPLEY (*S. A. E. [Soc. Automotive Engin.] Jour., 30 (1932), No. 3, pp. 120–128, figs. 23*).—Results of studies of alloyed cast iron are reported with particular reference to its use for cylinders and valve seats in tractor engines.

The results indicate that chromium in cast iron increases the hardness and strength by combining the carbon and producing a more stable double carbide of iron which crystallizes out with the pearlite. Nickel tends to dissolve this free-cementite-forming pearlite. A combination of the two alloys in the ratio of approximately 3 parts of nickel to 1 of chromium will produce an iron for engine cylinders which is superior to plain iron with respect to hardness, strength, and microscopic structure. The percentage increase of these properties varies almost as the percentage of alloys used.

Increased Brinell hardness is not desirable if accompanied by excessive free cementite, but it is an indication of increased quality when produced by a pearlitic or pearlitic-sorbitic structure. Nickel-chromium-alloyed irons are much superior with respect to heat-resistant properties than are ordinary irons. Alloying irons with chromium produces a superior chill and affords a practical method for production of special castings of this type.

The production and use of galvanized roofing sheets, G. C. BARTELLS and K. J. T. EKBLAW (*Agr. Engin., 13 (1932), No. 2, pp. 47–50, figs. 8*).—A brief summary is given of the process involved in the production of galvanized sheets and of their use on farm roofs. A survey made to determine the durability of galvanized sheet roofs covering 10 important farming States of the Middle West disclosed a considerable variation in the service life of galvanized sheets. It was found that in those cases where the weight of zinc coating was approximately 1 oz. per square foot the service life was comparatively short, but when the zinc coating was approximately 2 oz. per square foot the service life was much longer, the condition of the roof was good, and little or no rust had appeared. The roofs with heavy coatings gave indications of satisfactory service for a still longer period.

Tests of laminated bent rafters, H. GIESE and E. D. ANDERSON (*Agr. Engin., 13 (1932), No. 1, pp. 11–13, figs. 5*).—Results of laboratory studies conducted at the Iowa Experiment Station on the comparative stiffness of laminated bent rafters constructed according to several different specifications are reported.

It was found that a rafter consisting of five 1 by 4's laminated with 3 nails per foot and bolted with two ⅜-in. bolts 6 ft. on centers is 1.42 times as stiff as one of the same type nailed with 2 nails per foot and not bolted. A rafter consisting of six 1 by 3's laminated and bolted is 1.38 times as stiff as one constructed of five 1 by 4's not bolted. A glued rafter of six 1 by 3's laminated and bolted is 3.6 times as stiff as an unglued specimen of the same type. A glued rafter consisting of five 1 by 4's laminated and bolted is 2.6 times as stiff as the unglued rafter of the same type. A glued rafter consisting of five 1 by 4's laminated (not bolted) is 3.5 times as stiff as an unglued rafter of the same type. A rafter consisting of six 1 by 3's laminated requires only nine-tenths of the lumber of one consisting of five 1 by 4's laminated.

It is more important that bolts be used in the construction of unglued rafters than glued rafters. In bent rafter construction it is important that the best

material be used in the extreme fibers—the outer lamination next to the sheathing, and the inside lamination. Lower grade material may be used in the intermediate laminations.

The cost of glue in the construction of laminated rafters is 65 cts. for each 2-ft section of length of structure.

Agricultural fuels and lubricants (*Agr. Engin., 12 (1931), No. 11, p. 405*).—This is the 1930–31 report of the Committee on Fuels and Lubricants of the American Society of Agricultural Engineers.

A survey of the products of 20 manufacturers showed that compression ratios varied from 3.54:1 to 4.6:1, or 1 complete ratio. Practically all tractors burned gasoline, 60 per cent could burn kerosene, and a few could burn distillate. Only about 50 per cent used oil by standard viscosity number.

A preliminary study was made of a conventional 4-cylinder tractor engine in which the compression pressure was raised from 78 to 115 lbs. per square inch, the manifold was altered to allow direct exit of the burned gases, and a specially designed carburetor was installed. Several tests with various combinations of these alterations using kerosene, distillate, gasoline, and an antiknock fuel showed that the power could be increased considerably and the fuel consumption decreased. Further preliminary draft trials with this engine, installed in a tractor and using an antiknock fuel, showed a considerable increase in pulling power over what would be expected normally. The cost of fuel per unit of power also was lower. It is emphasized that these results are not final.

Farm gas engines and tractors, F. R. JONES (*New York and London: McGraw-Hill Book Co., 1932, pp. X+485, figs. 503*).—This book presents material which is based on the results of the author's experience in teaching the subject of farm power over a period of 15 years at the Agricultural and Mechanical College of Texas.

The book is divided into two distinct parts. Part 1 deals with the fundamental principles involved in the construction and operation of the simple internal combustion engine with particular reference to the small stationary farm-type engine. An introductory chapter discusses the relation of farm power to agricultural production and enumerates the primary sources of power with their adaptations and disadvantages. Following a brief discussion of early gas-engine development, such subjects as construction and operating principles, carburetion, ignition, and lubrication are taken up in complete detail with respect to both past and recent developments.

The second part covers the detailed construction and operation of the various types of farm tractors, and a special chapter takes up the fundamental requirements of the all-purpose or cultivating-type tractor, describing briefly the different makes now available together with their outstanding features. A final chapter deals with the tractor from the standpoint of selection and efficient utilization under different conditions.

In order to make the text better suited for use by research workers, a number of references are given at the end of the more important chapters.

The advantages of lessening radiation in the cylinders of internal combustion engines, F. I. DU PONT (*Amer. Phil. Soc. Proc., 70 (1931), No. 4, pp. 345–352, figs. 2*).—This report describes briefly experiments aimed at the elimination of detonation in internal combustion engines, drawing attention particularly to the development of tetraethyl lead for this purpose and to the technic involved. It was found that as little as 0.01 per cent will affect this phenomenon very appreciably and increase the thermodynamic efficiency to a very marked degree.

Relationship between volatility and consumption of lubricating oils in internal-combustion engines, G. WADE and A. L. FOSTER (*U. S. Dept. Com., Bur. Mines, Tech. Paper 500 (1931), pp. II+52, figs. 7*).—Studies conducted in a modified tractor engine with oils from four major petroleum-producing regions and with specially prepared or blended oils are reported, the purposes being to determine the physical and chemical characteristics of the oils by the customary tests, to test each oil under definite and uniform running conditions, and, at the end of each run, to determine the amount of oil consumed and the degree of change in its physical and chemical characteristics.

All of the lubricants studied appeared to give approximately equivalent efficiencies in lubricating the engine mechanism. One of the blended oils, representing a high-sulfur lubricating distillate with a relatively wide boiling range, showed the greatest susceptibility to decomposition in use. The increase in viscosity seemed to have some relation to consumption in the engine, but so far as was determined the ratio was inexact. The increase in viscosity was found to be greater as the volatility increased, this being especially noticeable in oils blended of two or more components differing widely in volatility.

No exact ratio appeared to exist between carbon residue and consumption, but in general, carbon residue increased as the consumption increased. It was found that the ratio of piston carbon to consumption was more nearly exact. It also was found that the consumption ratings of the different oils were not the same under different operating conditions or for different periods of operation. In the shorter runs a blend of a light and a medium grade oil, both made from Pennsylvania crude, was consumed at a relatively greater rate than in the longer runs.

While changes in volatility during use did not show a wide differentiation in the four commercial oils, the effect of light ends was shown in oils which were blended with varying amounts of light distillate.

The tentative conclusion is drawn that the exact and accurate evaluation of the comparative value of an oil in service is still a problem requiring exhaustive experimental and testing work, both in the laboratory and in actual use.

A Diesel engine designed for tractor service, C. G. A. ROSEN (*Agr. Engin., 13 (1932), No. 1, pp. 14–18, figs. 8*).—A detailed description of this engine is given, together with information relating to its adaptation to tractor service.

Gear loading practice in tractor design, L. JACOBI (*Agr. Engin., 13 (1932), No. 3, pp. 59, 60, figs. 2*).—This is an analytical discussion of gear loading practice.

Some factors affecting the economic use of tractor engines at part loads, E. G. MCKIBBEN and A. P. AGLIBUT (*Agr. Engin., 13 (1932), No. 3, pp. 73, 74, figs. 4*).—In a contribution from the Iowa Experiment Station, a mathematical analysis is presented of tractor engine operation at part loads. The results are presented graphically, and indicate the possibility of considerable saving by the proper adjustment of speed and carburetor for partial load operation. They also indicate that even as usually operated at or near rated speed a tractor engine can be used economically under present price conditions for many short-time operations requiring only a relatively small proportion of the rated power. It was found that with a ratio of engine cost per horsepower to gasoline cost per gallon of 300, it would require 400 hours of operation annually of a 30-h. p. engine at 12 h. p., or 40 per cent rated load, to justify the purchase of a supplementary 12-h. p. engine.

With speed and carburetor properly adjusted it was found that with a ratio of engine cost per horsepower hour to fuel cost per gallon of 300, it would require 200 hours of operation annually of a 30-h. p. tractor engine at 10 per

cent rated power to justify the purchase of a supplementary 3-h. p. engine on the basis of fuel saved.

The conclusion is drawn that more attention might be given profitably to the design of governors and carburetors for variable speed and load operation. Also the possibilities of increasing part load efficiency by operation at decreased speed should receive due consideration from designers when selecting belt speeds and gear ratios. The mathematical equations used in this analysis are included.

A study of tractor stop-hitches, A. W. Clyde (*Agr. Engin., 13 (1932), No. 3, pp. 75–78, figs. 5*).—The progress results of studies being conducted at the Pennsylvania Experiment Station on the dynamic properties of tractor stop hitches are reported, special attention being given to the overload release hitch with clutch throwout and the drawbar cushion spring with clutch throwout.

The results indicate that with either type of hitch the designer must decide the speed and grade against which protection will be given. In this connection a method of computing kinetic energy is presented which has been found to be fairly accurate if a proper value of the coefficient depending on the weight of rims and lugs or tracks is selected.

The value of the opposition to tractor motion by rolling resistance and by friction of the moving parts was found to vary considerably for different tractors when operating on firm sod. Tests by towing, measurement of stopping distance, and coasting grade gave values of from 145 to 185 for a few 2-wheel-drive machines. Tests with one track-type machine gave a value of about 110 because of decreased rolling resistance. It also was found that high drawbar efficiency puts a greater demand on a stop hitch. Also when the springs exerting force on the plow are used to stop the tractor, there is some limit to the force which they should exert. It was found in this connection that most cast shares can withstand a force of about 3,000 lbs., while steel shares are not damaged by forces of from 4,000 to 5,000 lbs.

A draft dynamometer for teams [trans. title], Von Ow (*Fortschr. Landw., 7 (1932), No. 1, pp. 15, 16, figs. 3*).—This dynamometer is briefly described and diagrammatically illustrated. The results of draft tests of a mowing machine are presented graphically.

Harvesting field peas with the combine, H. Beresford and E. N. Humphrey (*Idaho Agr. Col. Ext. Bul. 85 (1932), pp. 16, figs. 15*).—The results of field experiments on the harvesting of field peas with the combine are presented, together with practical information on the process. It was found that there was considerable shattering of the peas before the fields were entered with the harvesting machinery. By the semistationary combine method an average yield of 1,350 lbs. of harvested peas per acre was obtained in a 46-acre field, with a loss of 333 lbs. per acre. In a 55-acre field, harvested by the stationary thresher method, 1,104 lbs. of harvested peas were obtained per acre with a loss of 895 lbs. The average for 1,198 acres of peas harvested by the direct combine method showed a yield of 1,129.51 lbs. of harvested peas per acre, with an average harvest loss of 438.7 lbs. per acre.

A season's test of a hay drier, A. W. Clyde (*Agr. Engin., 13 (1932), No. 3, pp. 61–63, figs. 2*).—In a contribution from the Pennsylvania Experiment Station, results are presented of a service test for one season of a rotary, direct-drying type of hay drier having a rated capacity of 1 ton of water evaporated per hour. The machine was rated as a small type. While it was possible to turn out what appeared to be a splendid quality of alfalfa in rainy spells, it was not possible at any time to dry the hay as cheaply as with some of the larger machines. The data from the test are presented in detail.

Results of 1931 artificial drying studies, R. H. Reed (*Agr. Engin., 13 (1932), No. 3, pp. 69, 70, fig. 1*).—In a contribution from the Illinois Experiment Station, the results of studies during 1931 of the artificial drying of alfalfa and soybean hays are briefly summarized, particular attention being given to the effect of crushing on the rate of drying.

It was found that the crushed soybean hay dried very rapidly and at the end of 2.5 hours reached a moisture content of 30.1 per cent, while the uncrushed hay contained 34.7 per cent moisture at the end of 14 hours. There was an apparent decrease in the rate of moisture removal from alfalfa hay when from 70 to 75 per cent of the total moisture had been removed. It is considered entirely within the range of possibility that this decrease in rate of drying indicates a chemical or physical change in the plant structure which temporarily retards the loss of moisture.

Operation of rice driers in California with low air temperatures, G. P. Bodnar (*Agr. Engin., 13 (1932), No. 2, pp. 45, 46, fig. 1*).—A brief summary is given of results of experiments conducted by the U. S. D. A. Bureau of Agricultural Economics on the drying of rice with low air temperatures under California conditions. A type of drier that has been used successfully in the State for drying rice is briefly described and diagrammatically illustrated.

It appears that the drying of rice with unheated air involves the simple requirement that the unheated air shall be naturally of approximately the temperature desired for rough rice.

Characteristics of feed mill performance, E. A. Silver (*Agr. Engin., 13 (1932), No. 2, pp. 31–34, figs. 9*).—In a contribution from the Ohio Experiment Station, the results of studies are summarized of the performance of burr, hammer, and combination feed mills.

It appears that there is a lack of uniformity of size of ground particles, particularly in some grains such as shelled corn. There is also too much finely powdered material produced. The high speed in the case of hammer mills is responsible for this condition in no small measure. It was found that running the mill at a peripheral speed of 5,000 ft. per minute produced much more uniform grinding than when operated at a speed of 15,000 ft. per minute. It was also found that the present speeds of from 14,000 to 15,000 per minute, especially in hammer mills, are much above the critical or economical point, and that the most efficient speed is between 7,000 and 9,000 ft. per minute.

In the grinding of shelled corn the burr mill was found to require less horsepower and to be more efficient than the hammer mill at a grade of fineness from coarse down to a modulus of approximately 2.4. Below this modulus the hammer mill required less horsepower than the burr mill, but it was found that the burr mill will grind over a greater and coarser range than that of the hammer mill. Similar results were obtained in the grinding of barley.

Entirely different results were obtained in oats grinding, the high fiber content working to the disadvantage of the burr mills. This was indicated by the extremely high temperature of the material after grinding, the increase in temperature of the ground material over the unground material varying from 25 to 74° F., with a maximum temperature of 147°. For the hammer mill the increase in temperature varied from 4 to 23°. The mills under test usually showed the highest efficiency when working at or near full capacity.

The results as a whole are taken to indicate that the burr mill is adaptable to coarse grinding, while the hammer mill surpasses the burr mill for fine grinding. The burr type appears superior to the hammer type for grinding grains with a high starch content, whereas the hammer mill shows greater efficiency for grinding grains with a high fiber content.

A chart is presented showing the various grades of fineness of the most common grains and roughages.

Experimental studies on the destructive distillation of corncobs, O. R. Sweeney and H. A. Webber (*Iowa Engin. Expt. Sta. Bul. 107 (1931), pp. 15, figs. 3*).—This bulletin presents a detailed description of the apparatus and procedure used in the destructive distillation of corncobs and summarizes some of the results of earlier experiments. In addition, the uses for corncob distillation products are enumerated. The products obtained from the destructive distillation of corncobs are similar to those obtained from wood, being approximately, charcoal 25 to 35 per cent, total distillate 36 to 48 per cent, and gas 20 to 40 per cent. The distillate separates into crude acid, 25 to 35 per cent, and tar, 3 to 10 per cent. The crude acid is made up of acetic acid 2.6 per cent, acetone 0.03 to 0.6 per cent, and methanol about 1 per cent. The tar may be broken down into pitch and light oils.

Experiments in weed eradication by machine applied chemicals, K. R. Frost (*Agr. Engin., 13 (1932), No. 3, pp. 79, 80, figs. 2*).—Results of experiments conducted at the California Experiment Station on the eradication of weeds by chemicals applied by machine are briefly reported. In this connection an experimental machine was developed to inject carbon disulfide beneath the soil surface.

Tests to determine the effect of varying the depth, amount of chemical, and the distance between applications showed that the maximum possible kill of weeds, including especially orchard morning-glories, can be obtained by using 1.5 oz. of liquid per foot of travel, 20 in. between applications and 8 to 12 in. deep in a mulched soil. The application of carbon disulfide during the early part of the growing season seemed to be the most effective. A firm, moist soil that packs well was found to provide optimum conditions for application.

Stationary spray plants for commercial and farm orcharding, H. E. Lacy (*Agr. Engin., 13 (1932), No. 1, pp. 19, 20, figs. 4*).—The results of a survey are given of stationary spray plant practice in commercial orcharding in Georgia as a contribution from the Georgia State College of Agriculture. It is stated that at the present time there are 15 orchards in the State being sprayed from stationary plants.

Electric hotbeds, cold-frames, propagating benches, and open soil heating, I, II, G. W. Kable ([*C. R. E. A.*] *Natl. Rural Elect. Proj., College Park, Md., Rpts. 5 (1932), pp. 8, figs. 12; 6 (1932), pp. 9–36, figs. 23*).—This is in two sections.

I. *Recommended construction and use.*—This section of the report presents briefly the majority opinion of many investigators relative to the advantages, the best type of construction, and the correct methods of using electrically heated hotbeds, coldframes, and propagating benches, based upon present knowledge. Much of the information, which has been summarized in cooperation with the Committee on the Relation of Electricity to Agriculture, has been secured from several of the State experiment stations and from the U. S. D. A. Bureaus of Agricultural Engineering and Plant Industry.

II. *Investigations and research.*—This section presents a summary of experimental results and investigations under way relating to hotbeds, coldframes, propagating benches, greenhouses, and open soil heating. The information has been secured from various sources, including several of the agricultural experiment stations and the U. S. D. A. Bureau of Agricultural Engineering. A description also is given of experiments being conducted by the Committee on the Relation of Electricity to Agriculture, in cooperation with the Maryland Experiment Station, on the relative efficiency of over-heat and under-heat for hotbeds.

It was found that under the existing temperature conditions it was entirely feasible to grow a variety of plants successfully with electric heating elements either above or in the soil. Plants in the electric beds came through the ground more quickly than those in the manure bed.

While the plants were poor in the center and at the edges of the over-heat bed, and the growth was uneven, those plants in the optimum temperature zone grew best of all, and the relatively small excess of current used over the under-heat bed made further experiments with this type of heat desirable. Even with the uneven spacing of the electric elements in the under-heat bed, the growth of plants evened up nicely and was more uniform than in the manure bed.

The thermostats controlling the time when current was on and off acted very much in unison in the two electric beds except at outside temperatures around 60°, when the thermostat in the over-heat bed snapped on first and remained on longer. Heated soil produced better roots than where heat was supplied above the soil, and the underground wiring system to the beds was especially satisfactory.

Further studies showed that heating elements placed above the soil will warm the soil and hold the top 2 in. and the air at approximately the same temperatures. Placing the heating elements 6 in. deep in the soil results in rather wide variations in bed air temperatures. By combining over and under heating and varying the depth of heaters in the soil, a great variety of seed bed, air, and soil temperature effects may be secured. The tentative conclusion is that under-heat hotbeds should be used at the present time.

Some results also are presented from studies at the Maryland Experiment Station on frost protection in coldframes by electricity. In this connection the heating elements accomplished their purpose in protecting plants against possible damage from cold and at a reasonable cost for power. However, an attempt to raise the soil temperature to hasten growth during the first two weeks was a failure because of excessive rainfall.

A list of desirable additional investigations is included.

Electric dairy stable ventilation, F. L. FAIRBANKS (*Agr. Engin., 12 (1931), No. 12, pp. 443–445, fig. 1*).—Experiments conducted at the New York Cornell Experiment Station are briefly described and some of the preliminary results reported. The indications are that electric ventilating systems can be made as effective as the best natural draft systems. The belief is expressed, however, that they should be planned for approximately 8 months' continuous operation and 4 months' intermittent operation. For all weather of 32° F., or lower, and for all weather between 32 and 60°, the electric fan systems should operate 24 hours a day. They appear to have a special use in connection with dust removal in stable cleaning.

Heating and ventilating sweet potato storage houses, H. E. LACY (*Agr. Engin., 12 (1931), No. 12, pp. 451, 452*).—The progress results of studies conducted at the Georgia State College of Agriculture are briefly reported. These show that the most effective evaporation is secured by shortening the draft ducts to a minimum, thus reducing friction. The admission of large amounts of unheated air is also highly effective in causing evaporation, and both of these conditions are conducive to the highest fuel economy. Sloping ceilings, increasing the effective height above the top layer of crates and tending to streamline the exhaust currents to vents in the ridge, are conducive to greater uniformity in temperature throughout the storage space than are flat ceilings. The most uniform temperatures were obtained with distributed heat. It was found that uniformity of temperature is accompanied by uniformity of relative

humidity and of the evaporative and curing rates throughout the storage space.

The use of mechanical refrigeration for farm egg storage, P. T. MONTFORT (*Agr. Engin., 12 (1931), No. 12, pp. 439–441, figs. 4*).—In a brief contribution from the Texas Experiment Station, experience from different sources on the mechanical refrigeration of eggs is briefly reviewed, and a new project at the station on the subject, being conducted cooperatively with the Texas Committee on the Relation of Electricity to Agriculture, is outlined.

Descriptive data are also included relating to an 800-case egg storage vault.

Practical ice making, A. J. AUTHENRIETH and E. A. BRANDT (*Chicago: Nickerson & Collins Co., 1931, pp. 202, pls. 3, figs. 81*).—This is a treatise on the equipment of ice plants and their operation. It contains chapters on physical principles, the raw material of ice manufacture, why water treatment is necessary in the manufacture of ice, air agitation in ice making, mechanical equipment of ice plants, operating with efficiency, care of freezing systems, the purity of manufactured ice, and low temperature insulation.

Disinfection of wells containing bacteria [trans. title], P. ANDRE (*Gendhts. Ingen., 54 (1931), No. 38, p. 574*).—A very brief report is presented of the results of experiments which indicate that a lasting disinfection of well water which had been infected from the surrounding soil could be achieved by adding a large quantity of chlorine gas to the well along with sufficient water to raise the surface about 1 m. The water containing chlorine is thus forced into the surrounding ground. It may be necessary to waste some of the water, but if the well can be left out of use for a sufficient period of time the disinfected water is free from taste. The effect was found to last several months.

AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY

[Investigations in agricultural economics] (*Ohio Sta. Bimo. Bul. 155 (1932), pp. 65–68, 73–76, fig. 1*).—Investigations are reported as follows:

The cost of growing, harvesting, and storing apples, F. H. Ballou (pp. 65–68).—A table is included and discussed showing, by years 1924–1931, the costs per bushel of production, harvesting and preparing for market, transporting and storing, and the overhead costs at the Dale View test orchards in central Ohio.

Foreclosures on farm real estate in Putnam, Union, and Greene Counties, Ohio, 1910–1931, V. R. Wertz (pp. 73, 74).—Tables are given showing (1) the number of foreclosures, acreage involved, amount of judgments, and amount for which property sold, by years 1925–1931, and the averages for the periods 1910–1914, 1915–1919, 1920–1924 and 1925–1929; and (2) the number of farms and the number of acres assigned voluntarily to financial institutions, by years 1925–1931.

Prices of Ohio farm products, 1880 to 1931, J. I. Falconer (p. 75).—A table is given showing by years the price index of farm products.

Index numbers of production, prices, and income, J. I. Falconer (p. 76).—The table previously noted (E. S. R., 66, p. 679) is brought down through December, 1931.

Mineral resources of the country as related to farm lands (*U. S. Senate, 72. Cong., 1. Sess., Doc. 93 (1932), pp. VI+32, pl. 1*).—This report, made in response to Senate Resolution 377 of the Seventy-first Congress, third session, covers the results of a preliminary survey made by the Bureau of Agricultural Economics, U. S. D. A., of the relationships between the farmers who own potential petroleum lands and the oil industry. "The purpose has been to

ascertain how the farmers may best utilize their equities in unmined oil and gas. These potential resources are of great importance to landowners in the potential petroleum belts of the country. . . .

"Suggestions here presented concerning methods and practices in the organization and management of cooperative pools for handling farmers' petroleum rights should be regarded as tentative rather than as fixed and final conclusions. No attempt is here made to consider the technical geological and legal questions in connection with a pooling program. But it is possible that this report may be helpful in arriving at some practical plans for helping farmers to manage their oil and gas rights to greater advantage to themselves."

The agriculture of Holland, J. Frost (*Die Holländische Landwirtschaft. Berlin: Julius Springer, 1930, pp. V+249, figs. 61*).—The climate, soils, transportation facilities, agricultural history, size and tenure of farms, labor conditions, agricultural administration and organization, agricultural education, agriculture, agricultural industries, stock raising, dairying, horticulture, cooperation, marketing, land prices, rents, taxes, and duties are discussed.

Farm management studies (*Rhode Island Sta. Rpt. [1931], pp. [39], 41*).—Some findings for the year 1930, continuing the study previously noted (E. S. R., 66, p. 681) are given.

Factors in successful operation of rice farms in 1930, R. J. Saville (*Louisiana Stas., Rice Sta. Bien. Rpt. 1930–31, pp. 14–22*).—Data are reported and discussed showing the cost of producing rice on 268 rice farms and the various factors entering therein.

Factors affecting the price of rice, C. E. Campbell (*U. S. Dept. Agr., Tech. Bul. 297 (1932), pp. 56, figs. 19*).—The development of the rice-growing industry in the United States is described, and the factors affecting the prices of the southern and the California-Japan types of rice are discussed. Statistical analysis is made of the factors affecting the prices of the two types of rice.

"The size of the United States rice crop, together with carry-over in the United States, is the most important factor affecting domestic prices of rice. The general level of prices of other commodities is also an influential factor. California production is as important as southern production during certain periods of the year on prices of southern rice. Rough rice prices tend to move with prices of milled rice when rough rice is being marketed at a normal rate." In the southern rice belt changes in rice acreage are affected by the prices of rice prevailing during the three preceding years, that of the year immediately preceding exerting the greatest influence. The California acreage changes were closely associated with prices of rice the previous year and quantity of irrigation water available. Price changes of California rice in the San Francisco market were influenced chiefly by production plus carry-over in California, price changes of Blue Rose rice on the New Orleans market, and changes in Japanese rice prices in Tokyo.

The economics of bean production and marketing in Montana, R. R. Renne (*Montana Sta. Bul. 258 (1932), pp. 47, figs. 24*).—The importance of the bean industry in Montana, the costs of production and marketing, the farm prices received by Montana growers, prices in the United States and foreign markets, and the factors affecting bean prices since 1917 are discussed. The growing, harvesting, and marketing of beans in the State are described. The present situation as to prices, supplies, and demand is discussed, and suggestions are made as to improvements in production and marketing to meet the present situation.

The work of the inter-state early potato committee, A. E. Mercker (*Jour. Farm Econ., 13 (1931), No. 3, pp. 460–469*).—This is a description of the work

of the committee organized in 1928, and consisting of the directors of extension work in Maryland, Virginia, North Carolina, Florida, Georgia, and South Carolina, a potato grower or representative of growers and a dealer from each State, and representatives of the U. S. Department of Agriculture.

Farm production and consumption of poultry in Kansas, M. Evans and H. L. Collins (*Kansas Sta. Bul. 256 (1932), pp. 34, figs. 12*).—This study, made in cooperation with the Bureau of Agricultural Economics, U. S. D. A., and the Kansas State Board of Agriculture, is based on data regarding 399 flocks in 9 counties, representative of the 9 crop and livestock reporting districts of the State. The study covers the year beginning March 1, 1928. Tables and charts are included and discussed, showing the breeds of chickens kept and the size of flocks in each county; the composition and monthly changes in composition of flocks; the production and disposal of eggs, baby chicks, and other chickens; the value of eggs and poultry produced; and the contribution of the poultry flocks to the farm income.

Economic phases of the mohair industry in Texas, T. R. Hamilton (*Texas Sta. Bul. 444 (1932), pp. 32, figs. 8*).—Tables and charts are presented and discussed, showing for a period of years the production of mohair in Texas, other States, the Union of South Africa, and Turkey; the consumption and imports into the United States; and the prices of mohair in Boston and received by Texas producers. The outlook for future demand and production is also discussed.

An economic study of dairy farming in Grafton County, New Hampshire, 1930, M. G. Eastman (*New Hampshire Sta. Bul. 260 (1931), pp. 102, figs. 15*).—This report analyzes records obtained from 414 farms in 15 towns in Grafton County and 1 farm in Coos County for the year ended March 31, 1930. The population, physiographic features, soils, climate, agriculture, and economic conditions of the area are described. The age of farm operators, size of families, acreages in different crops, kinds and numbers of livestock kept, fertility practices, farm machinery, and household and barn equipment of the farms studied are discussed.

Tables are included showing the average capital, receipts, expenses, mortgage indebtedness, profits, labor income, and returns on capital. Analysis is made and tables are presented and discussed showing the relations of total capital, total acreage, cropped acreage, number of cows, man work units, total receipts, number of men per farm, crop index, milk production per cow, production index, price of milk, seasonal production of milk, methods of selling milk, use of milking machines, man work units per man, number of cows per man, milk production per man, crop acres per man, output index, receipts from crops, value of crop land, expenses for labor, expenses for feed purchased, education of operators, and other factors to labor income and to each other. Other tables show the average costs, by items, of milk production per farm, per cow, and per 100 lbs., and the relations to cost of milk production of number of cows, production per cow, hours of man labor per cow, seasonal distribution of milk production, and the amount of grain and of total succulence fed per cow.

Comparison is made of the labor incomes on the farms on which from none to all of the following five factors exceeded the average for all farms: Man work units per farm, man work units per man, production index, milk price per 100 lbs., and milk cost per 100 lbs.

"With reasonable price conditions the first requirement for successful farming in this region is to have some good cows, and the second is to have enough of these good cows to require a large farm and thus provide a good labor organization for from 2 to 3 men. This will make necessary the use of modern

labor-saving machinery and conveniences and will provide for their economic utilization."

An economic study of the Milwaukee milk market, W. P. MORTENSON (*Wisconsin Sta. Research Bul. 113 (1932), pp. 56, figs. 19*).—This bulletin is based chiefly on data secured in the summer of 1930 by interviews with 107 milk producers. In addition two group records covering 100 additional farms were obtained. The market conditions and transportation problem of the area are described. The problem of surplus and emergency milk, seasonal variation in production, the Milwaukee price plan, the relation of production to temperature, the variation in consumption, cooperation among producers, and the health department regulations and activities are described.

Marketing agricultural products in the United States, F. E. CLARK and L. D. H. WELD (*New York: Macmillan Co., 1932, pp. XIV+672, figs. 30*).—The subject is discussed under the following headings: Marketing functions, methods of sale, marketing at country points, wholesaling farm products, middlemen of the wholesale market, wholesale auctions of fruits and vegetables, retailing farm products, storage, cold storage, transportation as a factor in marketing, market finance, market news, price quotations, standardization, produce exchanges, market risk, future trading, future trading—hedging, cost of marketing, the prices of farm products, advertising, cooperative marketing, the State and marketing, farm relief, and defects and improvements.

Cost of marketing livestock by truck and rail, F. L. THOMSEN and W. R. FANKHANEL (*Missouri Sta. Research Bul. 165 (1932), pp. 32, figs. 15*).—Data were collected regarding actual trucking charges from cooperative commission companies covering 3,223 shipments of hogs, cattle, and sheep in 1930, and 1,837 shipments in 1931 to the St. Louis, Kansas City, and St. Joseph markets, and regarding local costs for railroad shipments from 169 local association managers and railroad agents for 1,016 shipments in 1930. Correlation analysis is made of the relation of rates and distances from market for each type of livestock in each market, and tables and charts are included and discussed showing the findings and making comparisons between the truck and rail rates, the rates for the two years, the rates for the three types of livestock, and the rates for the three markets. The total cost of marketing in 1930 by rail and by truck, the changes in rates and total costs from 1930 to 1931, and the changes in trucking charges from 1928 to 1931 in the Kansas City territory are also discussed.

Distance was the principal factor determining truck rates, but marked variations were found due to local influences. Truck rates in 1930 were highest for sheep, and those for hogs were slightly lower than those for cattle within about 100 miles and slightly higher for longer distances. Rail rates were highest for sheep and lowest for cattle, were more uniform as between kinds of livestock and markets than were truck rates, and on an average were lower than truck rates. For the State as a whole it cost more in 1930 to ship sheep by truck than by rail. Truck shipments were cheaper for hogs up to about 70 miles and for cattle up to about 50 miles. In 1931 the costs were lower by truck for all kinds of livestock to St. Joseph and for hogs to Kansas City. The costs for hogs to St. Louis and for cattle to Kansas City were about the same by truck or rail.

Marketing globe artichokes, E. A. STOKDYK (*California Sta. Bul. 524 (1932), pp. 66, figs. 10*).—Tables and charts are included and discussed showing the acreage and production of globe artichokes in California, 1924–25 to 1930–31; the shipments, 1929–30 and 1930–31, and distribution of shipments, 1930–31; and the prices received in various markets and the factors affecting such prices.

The trade channels for sales outside and within the State; the trade relations of growers, shippers, receivers, wholesalers, and jobbers; the associations for cooperative marketing; the efforts made to stimulate the demand for artichokes; and the packing, grading, and canning of artichokes are described. Some suggestions for improvement of marketing conditions are made.

Application of color measurement in the grading of agricultural products, D. NICKERSON (*U. S. Dept. Agr., Bur. Agr. Econ., 1932, pp. 36, figs. 4*).—This mimeographed preliminary report is a companion paper to the bulletin previously noted (E. S. R., 62, p. 508). The color terminologies for different commodities are outlined. The necessity for color conversion charts is discussed, and a method of conversion is described and illustrated by following through the processes involved in preparing a color conversion chart for alfalfa hay. The number of samples, number of estimates, the use of correlation methods, agreement of readings by different observers and instruments, color tolerances, training of observers, and color blindness are also discussed.

The use of artificial illumination for grading grain, D. C. ROSE (*Canad. Jour. Research, 5 (1931), No. 1, pp. 64–78, figs. 7*).—This paper is a contribution from the National Research Laboratories at Ottawa, Canada.

The first part is a description of artificial lighting units designed to give a suitable illumination for grading grain. Two types of illumination are under test, including the imitation of daylight by means of daylight lamps and the use of colored lights which emphasize the bad and good points in wheat. It has been found that a combination of a mercury lamp, a neon lamp, and a type S1 sun lamp gives promise of being a satisfactory source of illumination of the second type.

The second part of the paper describes experiments which comprise an attempt to find a more objective means of grading wheat. The light reflected from wheat of different kinds and different grades was analyzed both spectroscopically and by means of a photo-electric cell and light filters. In the spectroscopic measurements ultra-violet light was included. The results indicate a certain amount of selective reflection, but the variations with the different grades are not of a nature which would be helpful in grading wheat.

Handbook of foreign tariffs and import regulations on agricultural products, IV, V (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Trade Prom. Ser. 114 (1931), pp. XV+485, figs. 7; 131 (1932), pp. XIII+293*).—These are the fourth and fifth of the series previously noted (E. S. R., 63, p. 888).

IV. *Canned foods in Asia, Africa, and Oceania*, R. P. Wakefield and R. S. Hollingshead.—Information is given regarding the imports of canned foods, import duties and taxes, marking and documentation, and sanitary requirements of the food laws of the countries in Asia, Africa, and Oceania.

V. *Grains and grain products in Europe and other major markets*, R. P. Wakefield.—This gives information regarding United States exports to Europe and other major markets and the import duties levied and import regulations of the different countries.

Fresh vegetables, H. P. FLETCHER ET AL. (*U. S. Tariff Comm. Rpt. 39, 2. ser. (1932), pp. IX+176, figs. 3*).—This is a report of the U. S. Tariff Commission to the President of the United States on the differences in the costs of production of tomatoes; peppers; green or unripe peas, beans, and Lima beans; eggplant; cucumbers; and okra in the United States and the principal competing countries.

Financial structures of cooperatives, S. REED (*Fed. Farm Bd. Circ. 4 (1931), pp. 16*).—This is an address before the American Institute of Cooperation, held at Manhattan, Kans., June 11, 1931.

Selective migration from three rural Vermont towns and its significance (*Eugenics Survey Vt. Ann. Rpt., 5 (1931), pp. VII+82, pl. 3, figs. 12*).—This report discusses the importance of the rural exodus from the towns of Pomona, Beaufield, and Sylvania, the character of the emigration, the extent of the loss due to emigration, and its eugenical bearing.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Status of organization and administration of agricultural education among negroes, E. H. SHINN (*U. S. Dept. Agr., Ext. Serv. Circ. 173 (1932), pp. 11*).—This mimeographed circular discusses the origin and development of the movement resulting in the negro land-grant colleges, the agricultural curricula, and the objectives of agricultural education in such colleges.

Practical methods in teaching vocational agriculture, H. E. LATTIG (*New York and London: McGraw-Hill Book Co., 1931, pp. XII+360, figs. 12*).—The aim of this textbook is to provide concrete suggestions and set forth proved procedures to be followed in setting up a program in teaching vocational agriculture. The subject is dealt with under the following chapter headings: Selection of projects; building the course of study; the lesson plan; putting over the lesson; project plans; project records and accounts; project problems; project supervision; farm shop work and farm mechanics; judging and grading farm products; the evening school; the future farmer; publicity, exhibits, and community work; and reference material.

Edmund Ruffin, southerner, A. CRAVEN (*New York and London: D. Appleton & Co., 1932, pp. [XIII]+283, pls. 8*).—This book tells the life story (1794–1865) of a "gentleman farmer," a pioneer in the application of science to agriculture, who, by his investigations and writings, especially on "calcareous manures" (marl), made important contributions to the scientific knowledge of acid soils and their correction, and was influential in greatly improving farming on the exhausted soils of eastern Virginia.[4]

FOODS—HUMAN NUTRITION

The family's food, F. R. LANMAN, H. MCKAY, and F. ZUILL (*Chicago and London: J. B. Lippincott Co., 1931, pp. X+422, figs. 176*).—As stated in the foreword by A. Vivian, this volume of the series of home economics texts edited by B. R. Andrews "deals with the food problems of the family from the modern viewpoint, drawing upon the accumulated data of these last two decades of extremely active food research for all that they may contribute to the solution of these problems."

Throughout the text, which is designed for a high school course, greater emphasis is placed upon food selection than food preparation, the outstanding purpose of the text being the improvement in food habits through knowledge of the relation of nutrition to health. To this end the first six chapters deal with food selection and planning from the standpoint of the nutritive value of different groups of foods, the nutritive requirements of the various members of the family, and the adaptation in the diet necessitated by special conditions. The next four chapters deal with methods and standards in the preparation of the four principal groups of food. Chapters on the modern kitchen and its equipment, the serving of food, social customs at the table, the pleasures of hospitality, food budgets and food costs, and buying food for the household

[4] See also Cutter, W. P. A Pioneer in Agricultural Science. U. S. Dept. Agr. Yearbook 1895, pp. 493–502, fig. 1 (E. S. R., 8, p. 837).

complete the text. Each chapter closes with exercises designed to bring out the important points emphasized in the chapter and book, periodical, and bulletin references. Carefully formulated and standardized recipes are given in a 71-page appendix.

The farm family's food, H. McKay (*Ohio Sta. Bimo. Bul. 155 (1932), pp. 70–72*).—This brief popular discussion based upon the author's studies of food consumption and selection by rural families in the State (E. S. R., 66, p. 487) emphasizes particularly the value of fruits and vegetables in the diet.

Nutrition and diet in health and disease, J. S. McLester (*Philadelphia and London: W. B. Saunders Co., 1931, 2. ed., rev., pp. 891, figs. 14*).—A revision of the volume noted previously (E. S. R., 59, p. 187).

Amount of nutrients in Philippine food materials, F. O. Santos and S. J. Ascalon (*Philippine Agr., 20 (1931), No. 6, pp. 402–409*).—From published and unpublished data on the composition of Philippine food materials, the authors have calculated the distribution of the essential food constituents in grams and the fuel value in common units of measure of meat, poultry, eggs, cheese, fish, shellfish, vegetables, fruits, and beverages.

Analyses and calorific values of some Indian food-stuffs, A. D. Stewart, T. C. Boyd, and D. C. De (*Indian Jour. Med. Research, 19 (1931), No. 2, pp. 675–689*).—The food materials of Indian origin, for which chemical analyses and calorie values are reported, include cow's milk, buffalo milk, ghee; Burma, country, and Balam rice; white and brown atta and several varieties of dal; various seed oils; and cooked diets (European, Hindu, and Mohammedan) as issued to patients in a large general hospital in Calcutta.

The nutritive value of green, ripe, and sport coconuts (buko, niyog, and makapuno), F. T. Adriano and M. Manahan (*Philippine Agr., 20 (1931), No. 3, pp. 195–198*).—The data reported include the percentage distribution of milk, husk, shell, meat, and moisture, and the proximate analyses and fuel values on the wet and dry basis of three kinds of green, two of ripe, and three of sport coconuts.

The composition of bread, C. B. Morison (*Cereal Chem., 8 (1931), No. 5, pp. 415–417*).—Analyses are reported from the American Institute of Baking of 25 samples of bread from representative bakeries in different parts of the country.

The breads were all weighed at the bakery one hour after baking and immediately wrapped, packed, and sent to the Institute, where they were weighed, sliced, dried, and ground and analyzed by the Official method. The data are reported on the basis of water and solids content one hour after baking and also on the dry basis. The average values on the first basis are water 36.9, solids 63.1, protein (N×6.25) 9.44, nitrogen-free extract 48.54, crude fiber 0.36 fat 2.99, and ash 1.77 per cent. On the dry basis the values became protein 14.96, nitrogen-free extract 76.92, crude fiber 0.57, fat 4.74, and ash 2.81 per cent.

For comparison, the average values, as reported by the Connecticut State Experiment Station (E. S. R., 30, p. 664) and by Sherman (E. S. R., 52, p. 258), are given and discussed. The present analyses show a higher protein, fat, and ash content, with a decrease in total carbohydrates. These differences are attributed to a more general use at the present time of larger amounts of milk and shortening.

The cooking of cereal porridges, N. T. Cunningham (*Cereal Chem., 8 (1931), No. 5, pp. 403–408, figs. 5*).—The term "cooking" of a cereal porridge is defined as the process of gelatinizing the starch, and the degree of cooking as the percentage of gelatinization. A method is described for the analysis of cereals for gelatinized starch by determining the color-producing powers of

the gelatinized starch in an excess of iodine. The method has been employed to follow the course of cooking of a cereal product (corresponding to an unpurified hard wheat middling), using different proportions of cereal to water and different lengths of time. From the results obtained the conclusion is drawn that "when sufficient water is present, cooking proceeds to completion at a rate which is a function of the granulation of the dry cereal. When insufficient water is present, cooking proceeds at the normal rate for that cereal to a point at which the free water is apparently consumed. At this point gelatinization stops and further cooking is useless."

A study of methods for testing cake flour, J. W. MONTZHEIMER (*Cereal Chem.*, 8 (1931), No. 6, pp. 510–517, figs. 3).—The results obtained with several cake flours in baking tests, using standard formulas for different types of cake, are reported and discussed. The formula suggested by the committee on methods of testing cake and biscuit flours of the American Association of Cereal Chemists (E. S. R., 64, p. 281) was considered excellent for routine laboratory work, but to have the disadvantage of giving high tests with weak flours. The other formulas tested included the official bread formula, which was found unsatisfactory, hot water sponge cake, pound cake, and layer cake formulas. Of these the layer cake formula was considered the most desirable. The best cakes were produced from short patent finely ground flours.

Chemical leavening agents and their characteristic action in doughs, R. A. BARACKMAN (*Cereal Chem.*, 8 (1931), No. 5, pp. 423–433, figs. 3).—An apparatus for measuring the rate of reaction of baking powders in doughs is described, and a method is outlined for its use in determining the volume of dough expansion, the carbon dioxide lost from the dough, and, by difference, the percentage of total available carbon dioxide remaining in the dough for oven expansion. The method has been tested on two types of flour mixes—the biscuit type, representative of pancakes, hot breads, and biscuits; and the doughnut type, in which sugar and eggs are included. In the biscuit type water was used as the liquid and in the doughnut type milk. To these mixes soda and baking acids were added in suitable proportions. The baking acids included calcium acid phosphate, sodium acid pyrophosphate, potassium acid tartrate (cream of tartar), and phosphate-sodium aluminum sulfate. Two series of baking tests with biscuit doughs and cake batters were carried out to determine whether the results obtained in the laboratory tests could be correlated with actual baking results.

In comparison with the reaction in water, the effect of the dough ingredients upon the reaction was very pronounced, particularly in the case of sodium acid pyrophosphate which reacted relatively fast in water solution and slow in dough. The slope of the curves representing dough expansion due to entrapped carbon dioxide indicated a continued reaction over the 2- to 15-minute period representing so-called bench action. The curves showing the loss of carbon dioxide illustrated the difference between slow and quick acting reagents, and showed in general a loss of from 70 to 80 per cent of the carbon dioxide generated. The baking tests supported the conclusion that "the loss of leavening gas during the mixing of a dough is a real loss, and that the specific volume of baked product is proportional to the entrapped gas and unreacted soda remaining in the dough. Allowing the dough to stand results in continued reaction of the leavening ingredients which, when their product of reaction, carbon dioxide, is removed by manipulation of the dough, causes a reduction in volume."

On the separation of "gassing power" (diastatic activity) from "strength" in baking tests, H. JØRGENSEN (*Cereal Chem.*, 8 (1931), No. 5,

pp. 361–374, figs. 3).—The standard baking test of the American Association of Cereal Chemists is criticised on the ground that the amount of yeast is so high that a separation of diastatic activity from strength is not always obtained. "In the author's opinion the A.A.C.C. method would be a much more valuable one if the amount of yeast was reduced, for instance, from 3 per cent to 1 per cent, the method being otherwise unchanged."

Relation of quality in dry skimmilk to baking strength, O. Skovholt and C. H. Bailey (*Cereal Chem., 8 (1931), No. 5, pp. 374–380, fig. 1*).—A series of five dry skim milks was prepared by methods similar to those employed by Grewe and Holm (E. S. R., 61, p. 386), using preheating temperatures of 52, 68, 77, 88, and 96° C. The milk was held for only a few minutes at the lowest temperature, but the other samples were kept for 30 minutes at the given temperatures. The various samples, after being dried in the same manner, were used to the extent of 6 per cent in baking tests with a fairly strong hard wheat standard patent flour of medium baking quality.

The sample preheated to 77° gave the maximum improvement as measured by baking strength scores, although the water absorption of the dough and the viscosity of the milk powder in water suspension were not increased except at the higher temperatures.

In attempts to discover the specific cause of improvement in baking quality brought about by the preheating of the milk, H-ion concentration determinations of the milk in water and in flour-water suspensions were made but revealed insignificant differences. The electrical conductivity varied only slightly in water suspensions of the different samples. Insignificant differences were also found in the effects of the different samples upon saccharogenic activity.

Feeding experiments with mixtures of highly purified amino acids, I–III (*Jour. Biol. Chem., 94 (1931), No. 1, pp. 155–165, figs. 2; 167–171, fig. 1; 173–184, figs. 4*).—Three papers are presented.

I. *The inadequacy of diets containing nineteen amino acids*, W. C. Rose.—Two different mixtures of 19 pure amino acids (13 prepared in the laboratory from natural products and 6 synthetic products) were substituted for protein in an otherwise satisfactory diet for young white rats. The only known protein component absent from the first of these diets was hydroxyglutamic acid and from the other both hydroxyglutamic acid and serine. The only nitrogenous material of unknown nature in either diet was whatever might be contained in the 200 mg of yeast fed each animal daily as the source of vitamin B. The food was administered ad libitum and the experiments were limited to 36 days.

Both diets proved totally inadequate for growth. The animals lost weight rapidly for 12 days and then either lost weight more gradually or maintained their weight to the end of the experiment. No significant differences were noted in the behavior of the rats on the two diets. The food intakes were in all cases exceedingly low. The results are thought to indicate that growth-promoting proteins contain at least one essential dietary component other than the 20 known amino acids.

II. *The supplementing effect of proteins*, R. H. Ellis and W. C. Rose.—In the feeding experiments reported three diets were used, containing 5 per cent of gelatin, gliadin, and casein, respectively, in place of a like amount of the amino acid mixture, which was identical with that of the first diet in the previous study except that it contained no serine. On this diet the animals lost weight rapidly for 4 days, after which they grew slowly. Of the three proteins casein was the most, and gelatin the least effective.

III. *The supplementing effect of casein fractions*, W. Windus, F. L. Catherwood, and W. C. Rose.—In an effort to concentrate the material in casein

which brought about growth stimulation in the preceding study, the amino acids of hydrolyzed casein were fractionated into several groups, each of which was tested for its supplementing effect in a diet containing the 18 amino acids as the sole source of nitrogen. The rats were kept for 12 days upon the unsupplemented diet before receiving the various casein fractions.

The crude proline fraction had no supplementing effect. Slight improvement in growth took place on the diets containing the insoluble, dicarboxylic, and diamino acids, respectively. There was considerably better growth on the diets supplemented with the monamino acid fraction and the aqueous residues. On further extraction of the aqueous residues with butyl alcohol, a fraction was obtained which promoted normal growth when constituting 5 per cent of the diet. The fractionation was repeated three times on three different lots of casein with consistent results. On fractionation of casein by an entirely different method, the growth essential was also concentrated in the monamino acid group.

The data are thought to afford convincing proof for the hypothesis that growth-promoting proteins contain at least one indispensable dietary component other than the generally recognized amino acids.

Carbohydrate metabolism in birds.—III, The effects of rest and exercise upon the lactic acid content of the organs of normal and rice-fed pigeons, R. B. Fisher (*Biochem. Jour.*, *25 (1931), No. 4, pp. 1410–1418, figs. 2*).—In this continuation of the series of studies noted previously (E. S. R., 64, p. 497), the lactic acid content of organs other than the brain was investigated in order to determine whether they showed a similar increase in vitamin B deficiency. The method followed involved the use of iodoacetic acid as a fixative for lactic acid—a method considered satisfactory for the heart, less satisfactory for the liver, and of doubtful value in most circumstances for the pectoral muscles.

"Marked differences have been noted between the normal and the polyneuritic pigeon in the responses of the lactic acid contents of the heart, liver, and muscle to exercise and rest. It is suggested that these differences signify that in the normal bird lactic acid formed in exercise is very rapidly removed from the tissues, but that in avian polyneuritis the mechanism of removal is very greatly crippled. This crippling appears to bear a close relation to the avitaminosis underlying avian polyneuritis."

Some biochemical and physiological aspects of copper in animal nutrition, I. J. Cunningham (*Biochem. Jour.*, *25 (1931), No. 4, pp. 1267–1294, figs. 5*).—This report of an extensive investigation of the function of copper in animal nutrition includes data on the copper content of the different structural parts of the leek, lettuce, cabbage, carrot, beet root, potato, turnip, and garden pea, of various insects and marine animals, and various organs of a number of species of land animals; a discussion of copper and iron metabolism based upon feeding experiments with rats and hens; and a similar discussion of the toxicity of copper to animals.

The effect of copper in promoting the utilization of inorganic iron in hemoglobin building was confirmed, although the use of milk diets for the production of nutritional anemia in rats was criticized on the ground that the anemia thus developed may be due partly to Bartonella infection. The chief activity of the copper is thought to be located in the liver, which is considered to function in converting inorganic iron to organic iron, possibly in the form of an iron porphyrin. It is further suggested that this is brought about through a preliminary formation of a copper porphyrin and subsequent replacement of the copper by iron.

Calcium and phosphorus metabolism of infants receiving undiluted milk, M. Van K. Nelson (*Amer. Jour. Diseases Children*, *42 (1931), No. 5, pp. 1090–*

1099, figs. 5).—The observations reported were made on the same subjects and at the same time as in the study noted previously (E. S. R., 63, p. 892). The results obtained are summarized as follows:

"The average daily retention of calcium ranged from 0.070 g per kilogram at 2 months to 0.044 g per kilogram at 10 months of age.

"The average daily retention of phosphorus ranged from 0.040 g per kilogram at 2 months to 0.027 g per kilogram at 10 months of age. The calcium-phosphorus retention ratio ranged from 1.3 to 2.3, with an average ratio of 1.75 : 1. The average calcium content of the blood was 12 mg per 100 cc, with 10 as the lowest value obtained, and the average phosphorus content was 6.3 mg per 100 cc, with 5.4 as the lowest value observed."

The influence of diet on caries in children's teeth, N. G. Bennett et al. (*[Gt. Brit.] Med. Research Council, Spec. Rpt. Ser. No. 159 (1931), pp. 19, figs. 5*).—This is a preliminary report of a long-time investigation conducted upon about 400 children in three institutions to determine the effect of additions of vitamins A and D to the customary diet on the teeth during and after development. The general plan followed consisted in adding to the diet of all of the children in one institution cod-liver oil, in another treacle (molasses), and in another olive oil. At a later stage the children in the third institution were divided into two groups, one of which received untreated olive oil and the other the same quantity of olive oil to which radiostol (irradiated ergosterol) had been added. Quantities of the various supplements were adjusted to the ages of the children. Each child was given a detailed dental examination at intervals of six months. The present report deals only with the number of erupted teeth and the presence and extent of caries in the teeth erupted at the beginning of the investigation. A period of two years was covered in the first part of the investigation and one and one-half years in the comparison of olive oil with and without vitamin D.

The data, which were treated statistically, showed that in the groups of children, numbering from 65 to 86, in the comparison of cod-liver oil, treacle, and olive oil the progress of caries in the permanent teeth was significantly retarded in those receiving cod-liver oil as compared with those receiving the other two supplements. The increase in caries in the vitamin group during the period, whether measured by incidence or extent, was only about one-third that in the other two groups.

In the two groups of children, numbering 82 and 79, respectively, receiving olive oil alone and supplemented with vitamin D, the progress of caries in the permanent teeth was also significantly retarded in the vitamin group. With suitable allowance for the shorter time there seemed to be no appreciable difference in the rate of increase of caries in the group receiving cod-liver oil (vitamins A and D) and radiostol (vitamin D).

These findings are thought to justify the conclusion that the potent factor in retarding the development of caries in fully, or nearly fully, calcified teeth is vitamin D.

[Vitamin studies in Louisiana], G. Sunderlin (*Louisiana Stas. [Bien.] Rpt. 1930–31, pp. 91–93, 94, fig. 1*).—Preliminary determinations of the vitamin G content of potatoes of the Rural New Yorker variety indicate a tentative value of 0.5 Sherman unit per gram of the freshly peeled raw potato, while negative results are reported for vitamin D in shrimp meal and sun-dried shrimp.

Specificity in tests for vitamin A: A new conception of the chromogenic constituents of fresh and aged liver oils, I. M. Heilbron, A. E. Gillam, and R. A. Morton (*Biochem. Jour., 25 (1931), No. 4, pp. 1352–1366, pl. 1, figs. 6*).—Further evidence is reported pointing still more definitely to the existence of

two distinct chromogens in liver oils, and various hypotheses concerning their relation to vitamin A are presented and discussed.

It has been found that in a considerable number of oils characterized in the color test by predominance of the 572mμ band over the 606mμ band a large increase in the intensity of the latter band could be brought about by treating the oil with ozonized oxygen, hydrogen peroxide, or benzoyl peroxide, and that similar changes took place in the spontaneous aging of oils initially showing an excess of the 572mμ chromogen over the 606mμ. In neither case was there any appreciable change in the 572mμ chromogen or in the extent of absorption at 328mμ.

By slight modifications in the technic of the antimony trichloride test through adding a small portion of the reagent one minute before adding the remainder instead of adding all of the required amount at once, or less satisfactorily by varying the concentration of the antimony trichloride of the reagent, oils and concentrates in which the 606 to 620mμ chromogen predominated originally were changed to the extent that this chromogen was decidedly weakened or suppressed altogether.

Of the several hypotheses presented to account for this phenomenon, the most plausible is considered to be that the chromogen responsible for the 606mμ band "undergoes a real increase on ozonization by virtue of the presence of a precursor substance which is converted into Y either by spontaneous aging or accelerated oxidation. Such a precursor, if it exists, must be chromogenically inert, or relatively so, and will absorb rays of wave lengths near 328mμ comparatively feebly."

In line with this hypothesis physicochemical criteria for vitamin A are suggested as follows: "(1) A colorless or pale yellow substance exhibiting selective ultra-violet absorption free from fine structure and absorbing maximally at or near 328mμ, and (2) giving with antimony trichloride a colored substance characterized by a maximum in the yellow between 580 and 590mμ whilst the molecular extinction coefficients at 328 and 580–590mμ expressed in terms of vitamin concentration should be approximately equal."

The fate of carotene after absorption in the animal organism, B. Ahmad (*Biochem. Jour., 25 (1931), No. 4, pp. 1195–1204, fig. 1*).—Irregularity in growth response of rats following the administration of carotene as the source of vitamin A suggested the possibility of imperfect absorption from the intestinal tract. Inasmuch as the diet used was almost devoid of fat and the carotene was administered in solution in ethyl laurate, a series of experiments was carried out to determine whether or not the absence of fat might be the cause of the poor absorption of the pigment. Colorimetric estimations of the pigment in the alimentary tract of rats on diets of fat content varying from 0 to 10 per cent showed that the absorption of pigment varied to a striking extent with the fat content of the diet. In tests in which 0.1 mg of carotene in ethyl laurate was administered, 93.7 per cent of the carotene was recovered in the feces when the diet was low in fat, and only 11.7 per cent when it contained 10 per cent of fat.

A more detailed colorimetric and spectroscopic examination of the fats extracted from the feces and contents of the cecum of rats fed on a fat-free diet supplemented by 0.5 mg of carotene dissolved in ethyl laurate showed that the yellow color of the fecal fats was, within experimental error, due entirely to carotene, but that in the cecum fats carotene accounted for only about 50 per cent of the blue color with antimony trichloride. Spectroscopic examination of the fat in 1 per cent solution in alcohol showed a well defined band at 328mμ. When the value for pure carotene was deducted, it was concluded that the fat was exhibiting a band at about 325mμ of similar character to that associated

with vitamin A. Attempts to demonstrate the conversion of carotene into vitamin A by intestinal bacteria gave negative results in the majority of tests. In two instances, however, a substance of pale yellow color giving a more intense reaction with antimony trichloride than the original pigment was formed on anaerobic incubation, but it could not be identified as vitamin A. Attempts to convert carotene into vitamin A by incubation with rat liver tissue in vitro failed, as did also perfusion tests of intact liver of cats.

The administration of large doses of carotene by mouth to cats whose reserves of vitamin A had been depleted did not result in the appearance of vitamin A in the liver or blood up to 40 hours. In a final series of experiments cats were given small doses of carotene over long periods. The dose, usually 2 mg a day, was given in the form of an oily emulsion in separated milk. Two controls were given 1 cc of a cod-liver oil in the form of 2 cc of a 50 per cent emulsion. The controls grew normally and showed almost complete utilization of the vitamin A in the cod-liver oil supplement, as no trace could be found in the feces and the livers showed considerable storage. In the carotene-fed animals, however, about half of the carotene administered was excreted without absorption and there was very little deposit of vitamin A in the liver.

Studies on the antineuritic vitamin.—I, On the use of albino mice as test animals for determining the potency of antineuritic concentrates, W. FREUDENBERG and L. R. CERECEDO (*Jour. Biol. Chem.*, *94* (*1931*), *No. 1*, *pp. 207–212*, *fig. 1*).—Using mice instead of rats as experimental animals to test the various fractions, the authors fractionated rice polishings according to the technic of Jansen and Donath (E. S. R., 57, p. 489) with slight modifications. The activity of the various fractions corresponded closely with the results reported by Jansen and Donath. It is concluded that mice may be used to advantage as test animals for the evaluation of antineuritic concentrates when only small quantities of the material are available.

The distribution of the vitamin B complex.—II, Root vegetables, M. H. ROSCOE (*Biochem. Jour.*, *25* (*1931*), *No. 4*, *pp. 1205–1212*).—Continuing the investigation noted previously (E. S. R., 65, p. 590), the author has determined the content of vitamin B (B_1) and G (B_2) in potatoes, carrots, and turnips. On account of the relatively large quantities which had to be fed, the materials were incorporated in a portion of the diet. All of the diets were mixed with 50 per cent of water, and when the roots contained more water than would make up this amount they were dried partially at 37° C. to reduce the total water content to the desired amount. All of the diets were cooked for from 2 to 3 hours. The values reported are compared in terms of wet and dry weight, although the author's conclusions as to the relative potency of the materials tested are given, as in the previous study, in terms of dry weight.

As thus expressed, the vitamin B content of the carrot is considered to be about one-fifth that of dried yeast, "equal to that of the less good leafy vegetables, and better than that of egg yolk or milk. Turnip is not quite so rich in the vitamin, and potato is poor, being only one-fifteenth as rich as yeast. Carrot is one-fifth as good a source of vitamin B_2 as yeast and about equal to milk, meat, and less good leafy vegetables. Turnip is less potent, having the same potency as egg yolk and wheat germ. Potato has a low content of this vitamin, comparable with that of the cereals and pulses, but the relatively large amounts of this vegetable eaten may render it an important source of both the B-vitamins in an ordinary diet."

Expressed in terms of the minimal quantites of the fresh material required to produce the standard gain of 50 to 60 g in 5 weeks, the values given for vitamin B are yeast 0.25, carrot from 2.5 to 5, turnip more than 7, and potato

from 5 to 10 g. Similar values for vitamin G (B_2) are yeast 0.5, carrot more than 5, turnip 14.3, and potato from 10 to 20 g.

New spring carrots were found to contain no more of either of the vitamins than old carrots stored all winter. Neither of the vitamins in carrots was rendered more available by steaming for from 2 to 3 hours. Potato starch was found to contain small amounts of both of the vitamins.

The experiments are thought to indicate that vitamin B_4 was present in the vegetables tested in quantities sufficient for normal growth. Evidence is brought forward to indicate that the vitamin B requirement is not related to the total quantity of food consumed.

The physiological function of vitamin B_1, B. C. Guha (*Biochem. Jour., 25 (1931), No. 4, pp. 1367–1384, figs. 11*).—The problem of the rôle played by vitamin B (B_1) in the animal body was investigated by determining the requirement of rats for the vitamin as affected by the ratio of carbohydrate to protein, by the nature of the dietary carbohydrate, and by the quality and quantity of the dietary fat. Studies were also made of the effect of the ingestion or injection of sodium lactate and of the oxidative mechanism of the tissues in vitamin B deficiency.

The requirement of vitamin B for young growing rats receiving suboptimal doses of vitamin B was found to be independent of the protein/carbohydrate ratio of the diet. It was also independent of the nature of the carbohydrate of the diet as far as glucose, fructose, sucrose, and maltose were concerned, but with galactose and lactose as the sole dietary carbohydrates the animals lost weight.

Olive oil and palm kernel oil had no sparing action on vitamin B, but lard had a definite sparing effect.

The presence of lactate in the diet did not hasten appreciably the appearance of symptoms in vitamin B-deficient rats. The urine of animals receiving lactate plus vitamin B had a higher pH value than that of animals receiving lactate without vitamin B. The vitamin B-deficient animals showed a lowered tolerance to injected sodium lactate.

In studying the oxidative mechanism of the tissues in vitamin B deficiency, brain and liver tissues of normal and vitamin B-deficient rats were used with and without the addition of sodium lactate in anaerobic tests with the Thunberg methylene blue technic. The acceleration of the reduction of methylene blue due to added lactate was approximately of the same order for the tissues of the normal and the vitamin B-deficient animals.

Oxygen consumption tests in the Barcroft apparatus with chopped whole brain tissue showed some variations in the vitamin B-deficient as compared with normal animals, but not sufficiently regular to warrant definite conclusions except by statistical analysis of a very large number of results. There was no marked diminution in the cytochrome content of the liver, kidney, brain, and heart muscle tissues in the vitamin B-deficient rats.

The author concludes that the mechanism concerned in the oxidative removal of lactate is not seriously damaged in vitamin B deficiency.

Biochemical lesions in vitamin B deficiency, N. Gavrilescu and R. A. Peters (*Biochem. Jour., 25 (1931), No. 4, pp. 1397–1409, figs. 2*).—Evidence is presented in proof of the opinion expressed by Kinnersley, Peters, and Reader (E. S. R., 59, p. 294) that the symptoms of opisthotonus in the polyneuritic pigeon "might be associated with an oxidative deficiency in some small part of the brain insufficient in weight to be detectable in the oxidation of the tissues as a whole."

Vitamin C in the orange and the grape fruit, M. F. Bracewell and S. S. Zilva (*Biochem. Jour., 25 (1931), No. 4, pp. 1081–1089*).—In this investigation,

carried on in a similar way to the studies of the vitamin C content of apples (E. S. R., 65, p. 896), the influence of season on the potency of the orange and of season and variety on that of the grapefruit was investigated. The fruit tested included the Jaffa orange, picked from the same trees at different times of the season during two consecutive years, the Marsh and Duncan varieties (British Honduras) of grapefruit, also picked at different times of the season during two consecutive years, and the Marsh and Florida varieties (South Africa) of grapefruit, picked at the end of the season.

In addition to the vitamin C tests, data were obtained on the yield of juice, the total solids, acid content, and pH of the juice at regular intervals.

The vitamin C content of both the oranges and the grapefruit was found to be strikingly constant, not being affected by the conditions of cultivation, origin of the stock, age of the trees, nature of the soil, or period of storage of the fruit at 15° C. This was in marked contrast to definite changes in the other constituents examined. In relative potency the grapefruit had a slightly higher vitamin C content than the orange. It is concluded that "taking all the available information into consideration, one may safely assume that oranges and grapefruit bought casually in the open market under normal conditions ought to possess the full antiscorbutic value characteristic of these fruits."

The standardisation of vitamin D by the line test, F. J. Dyer (*Quart. Jour. Pharm. and Pharmacol., 4 (1931), No. 3, pp. 503–516, pl. 1, fig. 1*).—This investigation was undertaken to determine the extent of variation in the response of rats to vitamin D as determined by the line-test method with the technic of Coward (E. S. R., 59, p. 689), and to devise a means of evaluating the irregular results obtained.

Fifteen litters of 7 rachitic rats each were given graded doses of a standard solution of irradiated ergosterol containing from 0.0625 to 2 British units of vitamin D, 1 rat in each litter serving as a negative control. The usual technic for the line test was carried out, and photographs of the stained bone sections were graded in healing values from 0 to 6 by five different people, using for comparison a standard graded series of photographs. From the averages of the individual values three curves were constructed by plotting healing values against vitamin D dosage. One curve included the data from all 15 litters, and the other two from litters having a severe and less severe degree of initial rickets, respectively.

These curves have been found of value in interpreting line tests in cases where the results are too irregular to be interpreted by the usual method. It is emphasized, however, that each laboratory would have to construct its own curves before adopting the method.

On the fundamental nature of vitamin D action, J. P. McGowan, I. J. Cunningham, and D. W. Auchinachie (*Biochem. Jour., 25 (1931), No. 4, pp. 1295–1303*).—A series of experiments on rabbits is reported showing a similarity in the effect of massive doses of irradiated ergosterol and of chloroform poisoning. Since the effect of chloroform poisoning had previously been interpreted as indicating the setting free of phosphoric acid from body lipins to be neutralized by calcium to form insoluble compounds, it is concluded that "the probable mode of action of vitamin D in the cure and prevention of rickets is by the setting free from the lipins of the body of inorganic phosphate, the relative deficiency of which is regarded as the essential cause of rickets."

The anti-rachitic effect of acidophilus milk, G. Sunderlin (*Louisiana Sta. [Bien.] Rpt. 1930–31, pp. 90, 91*).—A brief summary is given of the general findings in a study of the prophylactic and curative effect of acidophilus milk and lactose on rickets in rats.

Studies in the nutritional anemia of the rat, I–VI (*Jour. Biol. Chem.*, 94 (1931), No. 1, pp. 71–88, 89–110, figs. 2, 111–115, 117–122, 123–134, figs. 8, 135–146, figs. 5).—This extensive investigation, dealing chiefly with the value of various inorganic elements as supplements to iron in the treatment and prevention of nutritional anemia in rats, is reported in six papers as follows:

I. *Influence of iron upon blood regeneration*, H. H. Beard and V. C. Myers.—Evidence is submitted indicating that, contrary to the now generally accepted theory, iron alone is capable of regenerating hemoglobin in young rats rendered anemic by milk feeding. The smallest unsupplemented daily dose of iron giving average hemoglobin recovery in 6 weeks and erythrocyte recovery in 4 weeks was found to be 0.25 mg, and this dose is considered to be the minimal daily iron requirement of the growing young rat suffering from nutritional anemia. The administration of 0.5 mg of iron daily to 95 anemic young rats gave an average hemoglobin recovery time of 6 weeks and erythrocyte recovery in 3.8 weeks. Two mg of iron daily appeared to be the most effective dose, bringing about average recovery of both cells and hemoglobin in 1.8 weeks. No better response was secured with 2.5 mg of iron.

Inasmuch as equally favorable results were obtained with iron solutions furnished by the Wisconsin and Ohio investigators who were unable to obtain complete hemoglobin recovery on iron alone and also by another investigator working independently in the authors' laboratory, it is concluded that "it seems unnecessary to assume that any other factors in addition to Fe, either inorganic or organic, are necessary for hemoglobin formation in this particular type of anemia, although traces of many other elements do have a supplementing (catalytic) action on small amounts of Fe."

Among the factors considered essential in nutritional anemia studies on rats are quantitative consumption of the iron and milk, satisfactory growth of the experimental animals, observations of the erythrocyte and reticulocyte counts as well as of hemoglobin, the use of a sufficient number of rats to overcome individual differences, and the establishment of the same initial level of hemoglobin in all cases.

II. *Influence of iron plus supplements of other inorganic elements upon blood regeneration*, V. C. Myers and H. H. Beard.—This study, noted from a preliminary report (E. S. R., 62, p. 695), of the effects of various metals as supplements to iron in hemoglobin regeneration has been extended to a total of 16 elements, each fed daily in varying amounts as a supplement to 0.5 mg of iron to rats rendered anemic by feeding on whole milk for from 5 to 8 weeks after weaning.

Cobalt, magnesium, and aluminum had no supplementing effect. The other elements tested with the minimum effective daily dose (considering hemoglobin recovery on 0.5 mg of iron alone as 6 weeks) were copper 0.025 mg, nickel 0.05, germanium probably 0.05, arsenic 0.01, manganese 0.1, titanium probably 0.1, zinc 0.1, rubidium, vanadium, chromium, and selenium probably 0.05, and mercury 0.04 mg. With 0.05 or 0.1 mg of iron, copper proved the most effective supplement, followed closely by manganese, arsenic, and chromium. With 0.15 and 0.2 mg of iron, vanadium appeared to be the most effective, followed closely by copper, manganese, and chromium. With 0.25 mg of iron, chromium was the most effective, followed closely by rubidium, germanium, and vanadium.

It is concluded that the action of these elements is probably catalytic in nature. In this connection the suggestion is made that the difficulty experienced by other investigators in securing supplementing effects for iron with other elements than copper may have been due to the selection of unsuitable doses.

III. *The prevention of anemia by means of inorganic elements*, H. H. Beard, C. Rafferty, and V. C. Myers.—Preventive experiments are reported briefly leading to the conclusion that inorganic iron has a prophylactic as well as curative action in this type of anemia and is as effective alone as when combined with copper, nickel, manganese, or arsenic.

IV. *The production of hemoglobinemia and polycythemia in normal animals by means of inorganic elements*, V. C. Myers, H. H. Beard, and B. O. Barnes.—Polycythemia and hemoglobinemia (excess red corpuscles and hemoglobin, respectively) have been produced in rats as follows: The addition of 0.5 per cent of vanadium to the stock diet produced a large increase in hemoglobin and a considerable increase in red blood cells and 1 per cent of both vanadium and cobalt marked hemoglobinemia and polycythemia. Iron alone fed in amounts of 0.5 mg daily as a supplement to milk increased the hemoglobin to 18 g per 100 c c. When further supplemented with 0.1 mg of zinc or manganese, 0.05 mg of copper or nickel, or 0.01 mg of arsenic, the hemoglobin was increased from 16.3 to 19.4 g per 100 c c. These findings are thought to furnish additional proof of the stimulating action of a number of elements in hemoglobin and red blood cell metabolism.

V. *The action of iron and iron supplemented with other elements upon the daily reticulocyte, erythrocyte, and hemoglobin response*, H. H. Beard, R. W. Baker, and V. C. Myers.—This paper deals with comparative reticulocyte and erythrocyte counts and hemoglobin values in groups of young rats on a stock diet, on milk, on milk supplemented with 0.25 mg of iron daily, and the same amount of iron with supplements of other elements in amounts proved optimal in the previous study.

The average values for rats at a weaning weight of from 40 to 50 g are given as about 10 g of hemoglobin per 100 c c and about 3 per cent of reticulocytes, and 4 weeks later a hemoglobin content of 13 to 14 g per 100 c c, a red blood cell count of from 7,000,000 to 8,000,000, and no change in reticulocytes.

In young rats rendered anemic on whole milk there was a progressive fall in red blood cells and hemoglobin and a rise in reticulocytes, indicating that nutritional anemia is characterized by a failure of reticulocytes to become converted into mature red blood cells.

The administration of 0.25 mg of iron daily was followed by an increase in reticulocytes to from 15 to 45 per cent of the red blood cells in 4 days. This lasted for about 6 days, after which there was a slow and gradual drop accompanied by a corresponding increase in erythrocytes and hemoglobin. This is thought to indicate that the chief function of iron in nutritional anemia is "to stimulate the hematopoietic organs in the bone marrow to produce new reticulocytes above the amount already present."

Following the feeding of optimum doses of the elements used in the previous study as supplements to iron, there was no difference in the formation of reticulocytes from that with iron alone, but on the fifth or sixth day there was a more marked fall in reticulocytes than would have been obtained with iron alone. The action of these supplements is thought to be the speeding up of the maturation of the red blood cells.

These findings are discussed particularly in comparison with the changes taking place in pernicious anemia. Diagrams are given illustrating the probable changes taking place in the blood in the successful treatment of these two conditions.

VI. *The effect of inorganic elements upon the rate of blood regeneration and growth*, H. H. Beard.—The final paper of the series deals with the average

weekly increase in erythrocytes and hemoglobin, with their percentage variations, the relation between increase in body weight and hemoglobin, and a comparison of the growth obtained with iron alone and with other elements in optimum doses. The results are summarized as follows:

"A linear relationship exists between the average hemoglobin content and the duration of the recovery period, expressed in weeks. The same is true for the erythrocyte recovery. Individual weekly determinations for hemoglobin and erythrocytes varied from the average weekly results for these constituents obtained with a group of 70 anemic young rats.

"A good relationship exists between the increase in hemoglobin and body weight. *These two processes take place simultaneously in anemic young rats* under Fe therapy during the first 3 weeks and may represent different aspects of the same growth process. When 0.5 mg of Fe is supplemented with optimum doses of other elements, better growth is secured than with Fe alone during the same length of time. Whether these mineral supplements actually play a rôle in the growth process, or exert their influence indirectly due to the increased metabolism resulting from the increased hemoglobin formation, is difficult to say. When 0.5 mg of Fe was supplemented with unfavorable or ineffective doses of other elements, less growth was obtained than with Fe alone (with three or four exceptions)."

Factors involved in the regeneration of hemoglobin, H. L. Keil and V. E. Nelson (*Soc. Expt. Biol. and Med. Proc., 29 (1932), No. 8, pp. 1040, 1041*).—In this preliminary report attention is called to the possibility that conflicting reports in the literature on the potency of various metallic salts in hemoglobin building may be due to differences in the extent of absorption. To test this point, various salts used in a previous study (E. S. R., 67, p. 87) were injected intraperitoneally into rats in doses of from 0.05 to 0.1 mg (arsenic at from 0.01 to 0.2 mg) daily. None of the salts which had failed as supplements to iron when administered by mouth proved effective on injection. Copper proved effective, and iron in the form of aqueous ferric citrate or ferric chloride dissolved in glycerin stimulated regeneration temporarily. Hemoglobin was regenerated in animals receiving 0.05 mg daily of copper as copper sulfate by mouth and 1 mg of iron as a suspension of ferric hydroxide by injection every other day. Intraperitoneal injection of very dilute hydrochloric acid caused a temporary rise in hemoglobin.

The necessity of copper as a supplement to iron for hemoglobin formation in the pig, C. A. Elvehjem and E. B. Hart (*Jour. Biol. Chem., 95 (1932), No. 1, pp. 363–370, fig. 1*).—This investigation, in which the authors had the cooperation of A. R. Kemmerer and W. R. Todd, was undertaken on account of the misinterpretation by various investigators of conclusions drawn in an earlier study of anemia in suckling pigs (E. S. R., 62, p. 367). In the former study no particular pains was taken to eliminate copper contamination because the authors were interested in results of a practical nature. In this study, young pigs kept under carefully controlled conditions and fed a milk diet developed severe anemia which showed only slight and temporary improvement following the administration of iron as ferric chloride, but rapid improvement with complete recovery following the administration of copper sulfate.

The paper includes a critical discussion of various reports concerning the rôle of copper in hemoglobin formation, particularly the series of papers by Beard and Myers noted on page 346, in which the conclusion was drawn that inorganic iron per se prevents and cures nutritional anemia in young rats. Attention is called to the explanation of Mitchell and Miller (E. S. R., 66, p. 597) that the slow regeneration of hemoglobin in rats receiving iron alone

as a supplement to milk was due to traces of copper available from the milk supply or stored in the body. The authors suggest that "it seems justifiable to apply one or both of Mitchell and Miller's explanations to the results obtained by Beard and Myers."

Low cost diets for diabetics, P. A. GRAY and B. S. STARR (*West. Hosp. Rev., 19 (1932), No. 4, pp. 28, 29*).—Sample diabetic diets furnishing 1,500, 1,800, 2,000, and 2,200 calories, respectively, and a carbohydrate: fat ratio of 2:1 have been prepared at a cost of 30.1, 30.75, 32.55, and 33.55 cts. a day, respectively, as based upon retail prices in Santa Barbara at the time of writing.

Pellagra: Etiology (modern theories) and pathologic anatomy, H. S. THATCHER (*Arch. Path., 12 (1931), No. 6, pp. 970–982*).—This review of the extensive literature on the subject deals with the deficiency, photodynamic, and parasitic theories concerning the etiology of pellagra and the pathological anatomy of the disease as it has been reported to affect the integument, nervous system, gastrointestinal tract, liver, pancreas, circulatory, respiratory, lymphatic, and genito-urinary systems, the endocrine glands, and the eyes.

A list of 95 references is included.

TEXTILES AND CLOTHING

Textiles and clothing, E. B. McGOWAN and C. A. WAITE (*New York: Macmillan Co., 1931, rev. ed., pp. XII+344, pl. 1, figs. 79*).—This is a revision of a well-known high school text, the previous edition of which was published in 1919 (E. S. R., 41, p. 698).

Some physical properties of starch pastes which affect their stiffening power on fabrics, M. S. FURRY (*U. S. Dept. Agr., Tech. Bul. 284 (1932), pp. 18, pls. 3, figs. 2*).—Some physical properties of six starches, potato, canna, corn, wheat, rice, and dasheen, and their pastes were studied. Length and width measurements of both the raw and swollen starch granules were taken by means of a filar micrometer, consistency determinations of the starch pastes at one concentration and temperature made by measuring their rate of flow through capillaries, and the penetrating and coating powers of the starches determined by examining cross sections of the sized yarns and fabric (celloidin-paraffin method; 10 μ; iodine-stained temporary preparations; photomicrographs × 200).

"The study shows that the stiffness of a sized fabric depends on the penetrating and coating powers of starch pastes, and these factors in turn depend in a general way on the consistency of the pastes. The findings indicate also that the size of the swollen starch granules bears a definite relation to the penetrating and coating powers of the starch pastes. Further evidence is given that the consistency of starch pastes depends on the size of the swollen starch granules."

HOME MANAGEMENT AND EQUIPMENT

Representative plans for farm houses, W. A. FOSTER ET AL. (*U. S. Dept. Agr., Bur. Agr. Engin., 1931, pp. 8, pls. 26*).—This is an extract from a report submitted to the President's Conference on Home Building and Home Ownership by the committee on farm and village housing, and presents a group of farmhouse plans which are representative of the best now available from the agricultural experiment stations, the U. S. D. A. Bureau of Agricultural Engineering, and leading agricultural journals.

Designs for Kansas farm homes, H. E. Wichers (*Kans. Engin. Expt. Sta. Bul. 23, rev. ed., 1931, pp. 117, figs. 51*).—This is a revision of a bulletin previously noted (E. S. R., 62, p. 674).

Size of rooms in five-room houses, D. Scoates (*Agr. Engin., 12 (1931), No. 12, pp. 450, 451, figs. 6*).—In a contribution from the Agricultural and Mechanical College of Texas, an adjustable chart is given showing the results of a study of 100 floor plans of 5-room houses in use in various sections of the South. The data relate to kitchen, dining room, living room, bedroom, and bath.

The data show that the prevailing sizes of kitchen are 10 by 12 and 12 by 14 ft., of dining room 12 by 14 ft., of living room 16 by 16 ft., and of bedroom 14 by 14 and 16 by 16 ft.

Size of rooms in five-room ready-cut houses, D. Scoates (*Agr. Engin., 13 (1932), No. 3, p. 78, fig. 1*).—Continuing the above study, a brief analysis of sizes of rooms found in an examination of plans in five plan books of large companies doing a national business in ready-cut houses are much smaller than those found in the farmhouse plans designed by architects.

Foundations for farm and village dwellings, G. M. Warren, T. A. H. Miller, and W. Ashby (*U. S. Dept. Agr., Bur. Agr. Engin., 1931, pp. 8, pl. 1*).—This is a contribution from the U. S. D. A. Bureau of Agricultural Engineering and represents a report submitted to the President's Conference on Home Building and Home Ownership by the committee on farm and village housing. It presents a brief description of accepted practices in the construction of small house foundations.

Some proposed standard measurements for kitchen equipment, D. G. Carter (*Agr. Engin., 13 (1932), No. 2, pp. 42–44, figs. 2*).—In a contribution from the Arkansas Experiment Station, the results of a study conducted cooperatively by the station and the committee on kitchens of the President's Conference on Home Building and Home Ownership are briefly summarized, and suggested standard measurements for the more important kitchen equipment are presented.

Proposed standard design for kitchen storage equipment, D. G. Carter (*Agr. Engin., 13 (1932), No. 3, pp. 67–69, figs. 7*).—In a contribution from the Arkansas Experiment Station, a structural method is suggested for kitchen equipment which utilizes the minimum number of different items, simplifies construction, is adapted to quantity production, provides an exact construction process, utilizes widely available stock materials, and effects a maximum cost reduction.

MISCELLANEOUS

Report of the [Louisiana] Agricultural Experiment Station for the years 1929–1931, C. T. Dowell et al. (*Louisiana Stas. [Bien.] Rpt. 1930–31, pp. 140, figs. 6*).—The experimental work not previously referred to is for the most part abstracted elsewhere in this issue.

Biennial Report of the Rice Experiment Station, Crowley, Louisiana, 1930–1931, J. M. Jenkins (*Louisiana Stas., Rice Sta. Bien. Rpt. 1930–31, pp. 27*).—The experimental work not otherwise referred to is for the most part noted elsewhere in this issue.

Forty-fourth Annual Report of [Rhode Island Station, 1931], B. E. Gilbert (*Rhode Island Sta. Rpt. [1931], pp. 39–62*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue. Meteorological data are also noted.

NOTES

Florida Station.—According to a note in *Florida Grower*, an estate of over 2,000 acres at Brooksville in Hernando County, recently presented to the Federal Government by the owners, Col. and Mrs. Raymond Robins, is to be utilized in part for experimental work by the U. S. Department of Agriculture in cooperation with the station. This estate is valued at $250,000 exclusive of a residence which is to be retained by the donors. The tract includes a 60-acre citrus grove, a dairying unit, a poultry farm, and other improvements, together with much virgin hardwood timber. Part of the property is to be converted into a game preserve and bird sanctuary, and the remainder is expected to be developed for experimental work with subtropical plants, a forestry culture and protection reserve, and a demonstration farm specializing in animal husbandry and poultry.

Iowa College.—Dr. Paul Emerson, associate professor of soils, has resigned to engage in commercial work.

Minnesota University and Station.—Dr. H. K. Hayes, chief of the division of agronomy and plant genetics, has been granted a year's leave of absence to be spent at Cornell University as acting professor of plant breeding. During his absence the division will be in charge of Dr. H. K. Wilson.

Missouri University.—At its recent commencement the honorary D. Sc. degree was conferred upon Dr. A. F. Woods, director of scientific work of the U. S. Department of Agriculture.

Ohio State University.—According to a note in *Agricultural Student*, John F. Cunningham, a graduate of the university in 1897 and publisher of *Florida Grower*, has been appointed dean of the College of Agriculture beginning July 1, vice Alfred Vivian, whose retirement has been previously noted.

At the recent commencement of the university, the honorary D. Sc. degree was conferred upon Prof. C. F. Marvin, chief of the U. S. D. A. Weather Bureau.

Necrology.—Dr. James M. Toumey, professor of silviculture in the Yale School of Forestry and a pioneer in American forestry education and research, died May 6 at the age of 67 years. He was a native of Michigan, a graduate of the Michigan College in 1889, received there the M. S. degree in 1896 and the honorary doctorate in forestry in 1927, and served as instructor in botany in 1890. From 1891 to 1898 Dr. Toumey was connected with the Arizona University and Station, becoming professor of botany and botanist, and in 1897–98 served as acting director of the station. Concerning this period, a recent appreciative statement in *Science* by Dean Henry S. Graves of Yale School of Forestry speaks as follows: "During this period Professor Toumey made very distinctive contributions to plant science. He conducted investigations in the fields of taxonomy, ecology, physiology and pathology, and also in entomology. He did special work on the date palm and became widely recognized as an authority on cacti. He established a cactus garden at Tucson which has been continued by his successors. He built up a large cactus herbarium, drawing upon it to aid the plant collections of Kew and other institutions. In 1897 he visited England and personally assisted in the systematic arrangement of the collection at Kew. About 25 articles and bulletins remain as a record of his investigative work in Arizona."

Doctor Toumey was appointed superintendent of tree planting in the Division of Forestry of the U. S. Department of Agriculture in 1899. Upon the estab-

lishment of the Yale Forest School in 1900, he became one of its original faculty. He served as dean from 1910 to 1922 and subsequently devoted himself to teaching and research. He had made many important contributions to the study of forest tree seeds and seedlings, the environmental factor affecting the life of seedlings, trees, and stands, and to the applications of silvicultural principles of intensive practice. He took a prominent part in the development of the experimental and demonstration forest owned by the school at Keene, N. H., and contributed extensively to the literature of forestry.

Dr. Nathan Augustus Cobb, widely known for his contributions to nematology, died in Baltimore, Md., June 4 at the age of 73 years. A native of Massachusetts, he was educated in the Worcester Polytechnic Institute and the University of Jena, receiving the Ph. D. degree from the latter institution in 1888. He had served in Australia as acting professor of biology at Sydney University, pathologist, manager of the Wagga Experimental Farm, and agricultural commissioner from New South Wales to Europe and the United States, as director of the division of physiology and pathology of the Hawaiian Sugar Planters' Experiment Station from 1904–1907, and subsequently as agricultural technologist in the Bureau of Plant Industry of the U. S. Department of Agriculture. He had discovered and described more than 1,000 new species of plants and animals, mostly nematodes, and was a voluminous writer on a wide range of subjects.

New Journals.—*Agricultural Journal* is being published quarterly by the Department of Science and Agriculture of Barbados as a report of its activities. It is announced that each April issue will contain a brief summary of the year's work, those in July and October will present results of experimentation, and the January number will be devoted as far as possible to scientific papers. The initial number contains the following: An Investigation into the Evolution of Sugar Cane Varieties by Breeding in Barbados, 1887–1925, with a Discussion on the Application of the Findings to the Present Day Scheme of Work, by A. E. S. McIntosh (pp. 3–17); A Survey of the Position of *Phytalus smithi* Arrow, and Its Natural Enemies in Barbados, by R. W. E. Tucker (pp. 18–23); The Scientific Control of Pan Boiling, by S. J. Saint (pp. 24–28); The Status of Trichogramma as a Control of *D[iatraea] saccharalis* in Barbados, by R. W. E. Tucker (pp. 29–36); The Inversion of Sucrose in Syrup Manufacture, by C. A. Coppin (pp. 37–40); Some Aspects of the Flora of Barbados, by F. Hardy (pp. 41–62); and Memorandum on the Cotton Situation in Barbados (pp. 63, 64).

The Journal of Animal Ecology is being published semiannually by the British Ecological Society at Fetter Lane, E. C. 4, London. It will present "primarily papers dealing exclusively with animals (such as population and migration studies and allied problems), and with methods of research having reference primarily to animals. On the other hand, comprehensive biological survey papers dealing with both plants and animals, papers on the nature of biotic communities, and such problems as effects of grazing on plant succession will appear as heretofore in *The Journal of Ecology*." The new journal will contain original papers, summary papers, abstracts, short notes, and reviews. The initial number contains among others the following: Studies of Fluctuations in Insect Populations.—I, The Infestation of Broadbalk Wheat by the Wheat Blossom Midges (Cecidomyidae), by H. F. Barnes (pp. 12–31); Notes on the Fruit Bats (*Pteropus* spp.) of Australia, by F. Ratcliffe (pp. 32–57); and The Bird Population on an Oxfordshire Farm, by W. B. Alexander (pp. 58–64).

EXPERIMENT STATION RECORD

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EDITORIAL

CHANGES IN THE INSULAR EXPERIMENT STATIONS

The act making appropriations for the support of the Federal Department of Agriculture for the fiscal year ending June 30, 1933, signed by President Hoover on July 8, 1932, changes materially the provisions made for the maintenance by the Department, through the Office of Experiment Stations, of experiment stations outside the States. In Alaska and Guam the stations which had been administered by the Department for many years were discontinued as of July 1, 1932. In the Virgin Islands the administration of the station was transferred from the Department of Agriculture to the Department of the Interior, with a reduced appropriation. Only in Hawaii and Puerto Rico was the previous status preserved. In the first-named Territory the work is continued with a slight reduction in appropriations, and in Puerto Rico, under special supplementary legislation, there is an increase for the island of $15,000.

The situation in Alaska is the culmination of a policy of retrenchment which has been developing for several years. Experimental work in that Territory was formally organized in 1898 to determine the agricultural possibilities of the region and develop types of farming adapted to its requirements. Great diversity in conditions in different parts of the area was speedily revealed, and a chain of experiment stations was set up at strategic points from time to time to meet the needs of settlers. A store of reliable information was thereby acquired and a substantial and timely service was rendered. The results of the enterprise were discussed in some detail in these columns at the time of the retirement of the pioneer Alaska leader, Dr. C. C. Georgeson (E. S. R., 57, p. 701).

The high point in the appropriations of the Alaska Stations was reached in 1928, when $85,000 was available. In 1929 an act was passed by Congress extending to the Territory the benefits of the Hatch and Smith-Lever Acts, and for the fiscal year 1932 $15,000 was made available to the Agricultural College and School of Mines of Alaska for experimental work in agriculture. Coincident with this

grant the appropriations for the Department's stations were reduced to $62,450, and the Secretary of Agriculture was authorized to turn over to the college the land, buildings, and certain equipment at the Fairbanks Station.

This transfer was duly effected in 1931, and in addition the livestock station on Kodiak Island was closed. Some of the agronomy and plant breeding work and the crossbreeding Yak-Galloway experiment at Fairbanks were reestablished at the Matanuska Station, as was also the animal husbandry work from Kodiak. Early in 1932 the administrative headquarters of the stations were removed from Sitka to Juneau in response to a plan of concentration of departmental activities as completely as possible at the Territorial capital. The action now taken signifies the complete withdrawal of the Department from direct experiment station administration in Alaska, leaving this field to the agricultural college, for which $15,000 is again provided. The Matanuska Station and its physical equipment have been transferred by the Secretary of Agriculture to the college, which is expecting to operate it on a reduced scale as a branch of its main station at Fairbanks.

The Guam Station, which had an appropriation in the fiscal year 1932 of $30,200, was opened in 1908 to improve and diversify the agriculture of the island along lines of self-sufficiency. It has concerned itself mainly with livestock improvement, crop production, and pest control, with more or less attention to extension phases. Its physical plant has now been transferred to the Island Government, and it is expected that it will be operated under local support as an agricultural school.

The Virgin Islands Station, originally established under the Danish régime, was acquired in 1918, following the purchase of the islands. Its primary aim has been to improve the agricultural conditions of the region and to relieve the serious situation brought about by changed economic conditions. Its principal activities have dealt with field and horticultural crops, animal husbandry, and veterinary studies. For its work in the past fiscal year $30,300 was allotted the Department, and following a survey of the islands conducted by the United States Bureau of Efficiency, its activities were reorganized and extended through additional grants of $37,015 transferred from appropriations made to the Department of the Interior. The latter department, which is now in charge of the administration of the islands, will have available in lieu of these amounts $25,000 for salaries and other station expenses in connection with "scientific investigations of the plants and plant industries and diseases of animals" and "demonstrations in practical farming."

The experiment station in Hawaii, operated since February, 1929, under the joint supervision of the Department and the University of Hawaii, receives $40,000 as a direct appropriation, a decrease of $3,520. The Territorial allotment under an extension of the Hatch and Adams Acts increases automatically, however, from $22,000 to $24,000, so that the net decrease for experimental work in the islands is $1,520.

The direct allotment to the Puerto Rico Federal Station at Mayaguez is continued at $63,560. An initial payment of $15,000 under a recent act which ultimately extends to Puerto Rico the full benefits of the Hatch, Adams, and Purnell Acts will increase the island's quota accordingly.

In addition to the sums already mentioned, an allotment of $30,000 is provided for the liquidation of the stations in Alaska, Guam, and the Virgin Islands. Authority is given to transfer the property of these stations, valued at $162,500 for Alaska, $37,300 for Guam, and $60,000 for the Virgin Islands, to any Government department or establishment or to local authorities or institutions, or to dispose of it by public or private sale. No provision is made for the continuance in the service of any of the employees of these stations, but authorization was given for the payment of traveling expenses of staff members appointed from the continental United States and the transfer of their families and certain personal effects from these remote localities to the usual port of debarkation in the United States. The legislation also prescribes the continuation of their salaries during such leave of absence as may have accrued to them from previous years, but because of general legislation appended to another act suspending during the fiscal year ending June 30, 1933, "all rights now conferred or authorized to be conferred by law upon any officer or employee to receive annual leave of absence with pay," it appeared doubtful at the time of writing whether the leave privileges thus authorized would be operative at least during the present fiscal year.

The aggregate of the appropriations for agricultural research in Alaska, Hawaii, Puerto Rico, the Virgin Islands, and Guam for the past fiscal year was $304,075. For the year just beginning $212,560 has been provided, of which $30,000 is for liquidation. The net reduction in Federal expenditures which has apparently been effected is, therefore, $91,485.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

A textbook of practical physical chemistry, K. FAJANS and J. WÜST, trans. by B. TOPLEY (*New York: E. P. Dutton & Co., 1930, pp. XV+233, figs. 74*).—A preface contributed to the present translation by F. G. Donnan notes, in part, that "in the case of every measurement the relevant theory is clearly indicated, and detailed references are given to those parts of well-known works where the student can obtain full information concerning the theoretical basis." The writer of this preface approves also the inclusion of "such important matters as radioactive transformations, spectrophotometric measurements, ultra-violet spectrography, metallography, potentiometric titration, the quinhydrone electrode, etc."; and the fact that "the descriptions of the experimental work are clear and explicit, but not such as to endanger the student's development of practical sense and manipulative skill."

In addition to this preface by Donnan, the book contains its authors' preface to the English edition, a general introduction, and the following chapters dealing with the theory and practice of the course of experiments which constitute the raison d'être of the book: Molecular weight determinations in solutions, vapor pressure and distillation of liquid mixtures, surface tension of liquids, the internal friction of liquids, adsorption from solutions, coagulation of a sol by electrolytes of different valencies, determination of hydrogen-ion concentration by means of indicators, calorimetry, metallography, the transformation of radio-elements, velocity of chemical reactions, refractometry, absorption of light—quantitative spectrophotometry in the visible region, ultraviolet spectrography, electrical conductivity of electrolytes, transport numbers, electromotive force, electrochemical preparations—general theory, and the lead accumulator. A subject index concludes the volume.

[Work in bacteriological chemistry at the Iowa Station], C. H. WERKMAN (*Iowa Sta. Rpt. 1931, p. 38*).—Brief reports are given of the progress of experimental work on the fermentation products of xylan, on the fermentation products formed from levulose by *Aerobacillus* sp., and on the adaptation and development of the method of partition between solvents for the determination of fermentation products. The last-named work has resulted in a procedure permitting the quantitative reading from a nomogram of the proportions of as many as three of the fatty acids after partitioning the aqueous solution of the acids with an ether such as isopropyl.

The history of the discovery of the amino acids, H. B. VICKERY and C. L. A. SCHMIDT (*Chem. Rev., 9 (1931), No. 2, pp. 169–318*).—The authors of this contribution from the Connecticut State Experiment Station and the University of California present an account of the isolation and the establishment of the structure of cystine, leucine, glycine, aspartic acid, tyrosine, alanine, valine, serine, glutamic acid, phenylalanine, lysine, arginine, iodogorgoic acid, histidine, proline, tryptophane, oxyproline, isoleucine, thyroxine, oxyglutamic acid, and methionine, summarizing also the work on some other products of protein hydrolysis. The paper contains also a bibliography of 415 items.

The apparent dissociation constants of certain amino- and hydroxy-amino acids and the changes in free energy and entropy conditioned by their ionization [trans. title], E. J. CZARNETZKY and C. L. A. SCHMIDT (*Hoppe-Seyler's Ztschr. Physiol. Chem., 204 (1932), No. 3-4, pp. 129-134*).—The apparent acid and base dissociation constants determined at 0° and at 25° for valine, hydroxy-valine, α-aminobutyric acid, and hydroxy-α-aminobutyric acid, and at 25° for alanine, glycine, and α-amino-n-valerianic acid are given, together with a tabulation of thermodynamic data including the apparent change in free energy, the heat of ionization, and the entropy change for valine, hydroxy-valine, α-aminobutyric acid, and hydroxy-α-aminobutyric acid.

An X-ray study of the coagulation of egg albumin, W. S. MILLER, K. G. CHESLEY, H. V. ANDERSON, and E. R. THEIS (*Jour. Amer. Leather Chem. Assoc., 27 (1932), No. 5, pp. 174-182, pls. 4, figs. 6*).—The change in the X-ray diffraction pattern of egg albumin appearing on coagulation of the protein was found capable of interpretation in support of that theory of coagulation which postulates "an elimination of water between free amino and carboxyl groups within the molecule." A possible explanation of the expansion of the outer ring of the diffraction pattern (decrease of spacing size) when the sample is soaked is suggested.

The heat of hydration of wheat flour and certain starches including wheat, rice, and potato, C. A. WINKLER and W. F. GEDDES (*Cereal Chem., 8 (1931), No. 6, pp. 455-475, figs. 6*).—The authors of this contribution from the University of Manitoba, determining the specific heats of the wheat flour and starches used by means of a method elaborated for the purpose, found the average value for the flour to be 0.397, for the starches 0.44 calories per gram of dry matter. Wheat starches showed essentially similar heats of hydration, the figures being somewhat higher than those for wheat flour at the same moisture content.

The heats of hydration of the starch of rice, wheat, and potato starches were found to differ widely at the same moisture content, and to increase in the order mentioned; but when potato starch was separated into two fractions consisting of large and small granules, respectively, there was no significant difference in the heats of hydration. Similarly, variations in the average size of the flour aggregates were not reflected in variations in the heat of hydration.

The conclusion was reached that hydration is not an external surface effect alone, but that the water permeates the starch granule. The nature of the starch was also found to affect the results. "The evolution of heat observed when water is mixed with wheat flour or starch has been shown to be due to adsorption, and this adsorption is not complex."

The practical significance of the results, from the point of view of bakery practice and the determination of the moisture content of biocolloids, is discussed.

A comparison of the utility of flour protein extractions in distilled water and in inorganic salt solutions, R. H. HARRIS (*Cereal Chem., 8 (1931), No. 6, pp. 496-509, fig. 1*).—Three series (1) of experimentally milled 75 per cent patent flours, (2) of millstream flours, and (3) of experimentally milled 95 per cent extraction flours were submitted to baking tests and were studied also in relation to their behavior in certain protein extraction tests. "The flours of the three series were extracted by distilled water for one hour, the suspended particles allowed to settle, and the extracted protein determined. The protein removed by similar treatment with 0.5 N solutions of potassium fluoride, potassium chloride, potassium bromide, and potassium iodide was also determined for series 3. In series 1, water extracted more protein than $MgSO_4$ in 42

flours, and also more, in series 2, for the 11 best quality millstream flours. In series 3, water extracted more protein than potassium fluoride in 11 of the 13 flours. Both $MgSO_4$ and potassium fluoride apparently exerted a coagulating effect upon the water-soluble flour proteins with the exception of low quality millstream flours.

"The quantity of protein extracted in series 3 was arranged in a Hofmeister series increasing with the increasing atomic weight of the peptizing agent, that is, in going from potassium fluoride to potassium iodide. High positive correlations were obtained between crude protein of flour and loaf volume except for the 20 millstream flours. High negative correlations were obtained between total crude protein of flour and percentage of total protein extracted and between loaf volume and percentage of total protein extracted, with one exception, in series 1. Partial correlations involving the use of extracted protein, nonextracted protein, and loaf volume showed very significant relations between nonextracted protein and loaf volume for water. The extracted protein showed no relation of any practical importance with loaf volume. Nonextracted protein became less significant in series 3 in going from H_2O to potassium iodide, while the extracted protein became more valuable."

Various other observations are recorded. In conclusion it is stated that "pure water would appear to be as useful as inorganic salt solutions for determining protein extractability with a view of forecasting baking strength."

A study of the proteolytic enzymes of malt preparations, K. A. Tissue and C. H. Bailey (*Cereal Chem., 8 (1931), No. 3, pp. 217–226*).—The authors of this contribution from the Minnesota Experiment Station found the safranine precipitation for proteolytic enzymes[1] to effect "a substantial, if not a complete," removal of such enzymes from wheat flour and malt extracts; and they obtained an active proteolytic preparation from the precipitate formed on adding safranine to diastatic malt preparations. This method of removing proteolytic enzymes was used in an investigation of the proteolytic and diastatic effects of malt preparations on wheat flour and in baking tests. The rate and extent of the proteolysis effected by the malt preparations was followed both by means of the copper hydroxide precipitation of the unhydrolyzed proteins and by the application of Sørensen's formol titration (E. S. R., 19, p. 808). The two methods were found to check well, but the titration method could be carried out more rapidly.

High diastatic malt extracts showed a greater proteolytic activity than medium diastatic malt extracts. The proteases of diastatic malt preparations were found to be precipitated by the use of safranine without any appreciable reduction of the diastatic activity of the preparations.

Malt preparations treated with safranine effected a material increase in loaf volume, and some improvement in grain and texture. When more than 0.25 per cent (on the basis of the weight of the flour) of medium diastatic malt extract was added to the bread formula, it was necessary to reduce the fermentation period by from 10 to 15 per cent; and when more than 0.25 per cent of high diastatic malt extract was added, it was necessary to reduce the fermentation period by from 20 to 30 per cent and the proof period by 10 minutes to prevent over-fermentation of the doughs.

Report on special avocado investigations, L. N. Bilger, W. Y. Young, and R. C. Robbins (*Hawaii Sta. Rpt. 1931, pp. 14–17*).—Results of studies of the isolation of the bitter principle from the avocado seed and estimations of the sterol content and vitamin value of the avocado oil are here noted.

[1] Biochem. Jour., 17 (1923), No. 6, pp. 851–859.

Composition of Philippine rice oil (Hambas variety), A. O. CRUZ, A. P. WEST, and N. B. MENDIOLA (*Philippine Jour. Sci., 47 (1932), No. 4, pp. 487–495, pl. 1*).—The authors determined the fatty acids of the oil obtained by an extraction of rice bran, separating the saturated from the unsaturated acids by means of the lead-salt-ether method as applied by Baughman, Brauns, and Jamieson (E. S. R., 44, p. 503). The oil appeared to consist principally of the glycerol esters of oleic, linolic, and palmitic acids, and to be very similar in composition to cottonseed, kapok, and peanut oils. An extraction plant would appear necessary for the commercial production of this rice oil, practically no oil having been obtained from the bran in a hydraulic press at 4,000 lbs. pressure.

Production of organic acids from carbohydrates by fermentation, O. E. MAY and H. T. HERRICK (*U. S. Dept. Agr. Circ. 216 (1932), pp. 31*).—Mycetal and bacterial processes for the preparation of acetic, butyric, citric, formic, fumaric, gallic, gluconic, kojic, lactic, malic, oxalic, propionic, and succinic acid are briefly described; this summary of fermentations, their causal organisms, and their principal products being followed by 81 references to patented processes and a general bibliography of 118 further items.

Rancidity, H. O. TRIEBOLD (*Cereal Chem., 8 (1931), No. 6, pp. 518–532, figs. 2*).—A somewhat extended review of published work is presented in a contribution from the Pennsylvania Experiment Station, the discussion taking up the topics of theories regarding the development of oxidative rancidity, tests for oxidative rancidity, methods for studying the susceptibility of fats to autoxidation, factors influencing oxidative rancidity, and antioxygenic catalysts and the autoxidation of fats.

The experimental work included a spectrophotometric examination of the colors developed in the Kreis test for rancidity, in which it was shown that the greatest absorption of light by the solutions occurred at the wave lengths 530, 540, 550, and 560 and 570 mμ, with a maximum at 550 mμ, in the case of a lard examined after the absorption of 0, 10, 50, 100, 200, 300, and 400 cc of oxygen per 100 g of the lard. Similar data were secured for six other types of shortenings.

"It would appear from these results that the quantitative determination of the degree of oxidative rancidity could be fairly accurately determined for all shortenings, especially at the lower oxygen absorptions, by a spectrophotometric study of the intensity of the Kreis test." It is emphasized, however, that the work thus far completed is of a preliminary nature only and is not to be used as a basis for definite conclusions.

Effect of heat at varying concentrations of hydrogen ion on vitamin G (B_2) in protein-free milk, N. HALLIDAY (*Jour. Biol. Chem., 95 (1932), No. 1, pp. 371–385, figs. 4; abs. in Michigan Sta. Quart. Bul., 14 (1932), No. 4, pp. 293, 294*).—This contribution from the Michigan Experiment Station reports an investigation by the author, with the assistance of M. J. Nunn and J. D. Fisher, of the stability of vitamin G to heat and alkalinity and a critical examination of the data obtained with reference to various technics proposed for the assay of vitamin G (B_2).

The protein-free milk used as the source of vitamin G was prepared as follows: Skim milk powder was mixed with distilled water and treated with 1 per cent HCl to precipitate the casein as completely as possible and the mixture boiled for 5 minutes, cooled, and filtered. The filtrate was tested at its natural acidity, pH 4.3, at pH 7, and 10, and all of these solutions after 1 or 4 hours of heating in a water bath at about 97±1° C. The various materials were prepared weekly and tested in graded doses, the same quantities of skim milk powder being used

for comparison. The method of Bourquin and Sherman (E. S. R., 66, p. 410) was followed, with the exception that the casein was extracted with cold dilute acetic acid for 1 week, with the acid changed daily, and then dried, ground, and extracted for 1 hour in boiling 95 per cent alcohol. In order to compare the results obtained using the different lengths of time proposed by various investigators, the data were evaluated as to "(1) gain in weight of the experimental animals in 8 weeks above that made by litter mate negative control rats; (2) gain made by the experimental animals during the first 4 weeks of the experiment; (3) gain made by the experimental animals during the second to the fifth week of the experiment; and (4) potency of the materials in curing dermatitis in rats."

Growth curves are presented showing both the growth of the animals above that made by litter mate negative controls and the actual growth. Although the two sets of curves did not correspond exactly, the same conclusions could be drawn from both, namely, that the vitamin was completely extracted from the milk powder into the protein-free milk at pH 4.3; heating for 1 hour at pH 4.3 resulted in a 10 per cent loss, at pH 7 a 30 per cent loss, and at pH 8 to 10 a 40 per cent loss; the losses on heating at these pH values for 4 hours were 30, 50, and about 75 per cent, respectively; and that holding the solution 1 week in the cold caused practically no loss in activity at pH 4.3 and 7, but a 75 per cent loss at pH 10.

The author's conclusions concerning the relative reliability of the various experimental periods adopted are that "if the basal diet appears to carry an appreciable amount of the vitamin, the gain over the litter mate negative control would be a more accurate measure of the potency of the material tested. If, on the other hand, the actual gain is used as the criterion, the experimental period should end when the rate of growth slackens. In these experiments the growth appeared to be more consistent during the second to the fifth week than during the first 4 weeks.

"If the cure of dermatitis lesions was used as a criterion there was little correlation with the results just reported, perhaps because in the cases about to be described the animals were too far weakened by the vitamin G deficiency to permit of their making good recoveries."

On the decolorization of discolored natural waters and of aqueous extracts of soil and peat [trans. title], B. A. Skopintzew (*Ztschr. Analyt. Chem.*, *86* (*1931*), *No. 5–6*, *pp. 219–235*).—Producing aluminum hydroxide in samples of colored natural waters and of aqueous soil extracts by adding practically equivalent quantities of aluminum sulfate and potassium hydroxide was found both to be effective and to have the advantage over the use of animal charcoal and other chars, calcium hydroxide or carbonate, and copper hydroxide, that it did not interfere with subsequent determinations of ammonia, nitrites, and nitrates. The best results, with increased decolorization efficiency, were secured by proportioning the coagulating reagents exactly so as to bring about a pH value of approximately 5.0. The potassium sulfate produced did not interfere with the subsequent determinations, except that in the case of the nitrate determination when much potassium sulfate was present it was found necessary to heat the dry residue with the phenoldisulfonic acid reagent for one minute on the water bath in order to insure complete mixture. At nitrate concentrations of 4 mg in a liter and at pH values of from 5 to 7 the losses ran as high as 12 per cent of the total nitrate content; but when the aluminum colloid was precipitated from proportions of the reagents such as to produce a final pH value between 4.5 and 5.0, no loss of nitrate was observed. The precipitated "humates" occasioned no losses from soil and peat extracts within the pH limits noted except in the presence of very large proportions of the

colorants. The nitrate losses observed at pH values above 5.0 are attributed to a combination of the influence of the aluminum hydroxide with that of adsorption by the precipitated humates.

Use of oxygen in the quick determination of ash, R. B. POTTS (*Cereal Chem., 8 (1931), No. 3, pp. 232, 233*).—The author replaced the usual crucible with a flat-bottomed silica capsule 1¾ in. in diameter and ½ in. deep, thereby shortening the time required for burning the sample by about one-half; and, in applying oxygen to hasten the process, he used two muffles of which the first was held at a temperature of 800° F., the samples being "allowed to remain in *this furnace 40–50 minutes, or until the black mass starts to curl around the* edges and shrivel toward the center of the capsule." The second furnace, maintained at a temperature of 1,100° and fed a stream of oxygen from a compressed cylinder through an Alsop chlorine regulator at the rate of 150 bubbles per minute, was made air-tight, asbestos packing being used around the ⅜-in. iron pipe through which the oxygen was introduced. "The rate of flow of oxygen should vary with size of furnace and number of ashes to be burned, but the ash should assume a reddish glow immediately upon being introduced into the *oxygen. The ashes are left in this furnace ¾ to 1½ hours, or until such time as it will take for them to assume a white or light gray color.*"

The determination of aluminum and of excess acid in aluminum salts, H. L. DAVIS (*Jour. Phys. Chem., 36 (1932), No. 5, pp. 1449–1455*).—The author of this contribution from Cornell University shows that in a sample of an aluminum salt it is possible to titrate first the excess acid and then the aluminum content, with the use of thymol blue as indicator. "If the salt is a basic salt, then a portion of a known excess of standard acid will be used in *correcting this and the remainder will be titrated by the method.*

"The determination of sodium oxide and of alumina present in a sodium aluminate solution can be made similarly by the use of the same indicator."

The behavior of the glass electrode in aqueous solutions of sodium and barium acetate, M. DOLE (*Jour. Phys. Chem., 36 (1932), No. 5, pp. 1570–1573, figs. 2*).—Of the departures of the glass electrode from theoretical values in solutions of relatively high pH value, it is noted that "if the barium acted solely through its mobility across the boundary, one would expect that the *sodium ions would cause just as large an error in the presence of the barium as by themselves* (except for a *possible* change in the activity of the sodium ion due to a change in the ionic strength), but if the effect of the barium ions is to change the mobility due to a change in the Helmholtz double layer, one might expect the mobility of the sodium ion also to be changed and with this change in mobility a change in the error of the glass electrode."

Measurements of cells, including the glass electrode in solutions of sodium acetate with and without the addition of barium acetate, with the calomel-saturated potassium chloride half cell as reference electrode showed that the glass electrode acts in mixtures of sodium and barium as if no barium were present, indicating that the barium ion does not affect the mobility of ions across the glass aqueous solution interface by any effect of its double positive charge on the Helmholtz double layer.

On the determination of nitrates by means of electrolytic reduction [trans. title], L. SZEBELLÉDY and B. M. SCHALL (*Ztschr. Analyt. Chem., 86 (1931), No. 1–4, pp. 127–134, figs. 3*).—For the electrolyte in which the nitrate sample is to be reduced the authors propose the substitution of a neutral solution containing boric acid so that a direct titration of the ammonia may be possible. It was shown that a nickel cathode served as well as a copper cathode to secure complete reduction, an observation considered to make highly improbable the theory that the cuprous ion plays a catalytic rôle in the reduction.

The rapid volumetric determination of nitrates [trans. title], P. SZEBELLÉDY (*Ztschr. Analyt. Chem., 87 (1932), No. 9-10, pp. 357, 358*).—In the reduction of nitrates by a boiling solution of stannous chloride in the presence of hydrochloric acid the author found two reactions to occur simultaneously:

(1) $2KNO_3+10\ HCl+4\ SnCl_2=N_2O+5\ H_2O+2\ KCl+4\ SnCl_4$; and
(2) $KNO_3+9\ HCl+4\ SnCl_2=NH_4+3\ H_2O+KCl+4\ SnCl_4$

About 20 per cent of the nitrate was reduced in accordance with the first, the remaining 80 per cent in accordance with the second of these reactions. On determining the reduction factors for known quantities of nitrates by known excesses of 0.1 N stannous chloride, the author found that the variations of the factor with the percentage of excess of the tin compound were not so great as to exclude analytical accuracy, however; and he proposes to determine nitrates by dissolving the sample in the minimal quantity of water, adding an excess of a stannous chloride solution standardized against 0.1 N iodine, together with a volume of concentrated hydrochloric acid equal to the combined volume of the nitrate and reductant solutions, distilling off three-fourths of the liquid, and titrating, after cooling, with 0.1 N iodine solution. Each cubic centimeter of 0.1 N stannous chloride solution was found to be equivalent, if 50 per cent excess of the reductant was present, to 1.52 mg of potassium nitrate; if 100 per cent excess, 1.5 mg; if 200 per cent excess, 1.45 mg; and if 300 per cent excess, 1.4 mg.

The application of hexamethylenetetramine as an analytical reagent for the determination of the metals of the ammonia group in the presence of manganese, nickel, cobalt, and magnesium [trans. title], P. RÂY (*Ztschr. Analyt. Chem., 86 (1931), No. 1-4, pp. 13-24*).—Essentially, a 10 per cent solution of hexamethylenetetramine was substituted for ammonium hydroxide solution as a reagent for the precipitation of the hydroxides of the metals determined. The separation by means of the procedure given of iron from the metals of the ammonium sulfide group was found to be effected by a single precipitation. Even aluminum could be separated satisfactorily except from nickel. The separation of aluminum from zinc in the presence of large proportions of the latter element was not complete, however. Titanium gave no trouble except in the presence of large proportions of zinc. Uranium was well separated from the bivalent metals by means of the procedure specifically prescribed for that purpose. Phosphoric acid, when present, was found to be precipitated with the iron and aluminum; and phosphates interfered but slightly if iron and aluminum were present in excess.

Field method for estimating nitrate, phosphate, and potassium in plants, E. M. EMMERT (*Plant Physiol., 7 (1932), No. 2, pp. 315-321*).—The field pack of apparatus and chemicals necessary for the three tests is detailed. The prescribed procedures are as follows:

"Nitrate test.—This test should be made at once, to avoid enzymic reduction which will occur if the extract is allowed to stand. Put enough of the extract (usually 0.2-1 cc) to give a good yellow nitrate color into a 25-cc evaporating dish, add an equal volume of 3 per cent NaOH, and evaporate to dryness without spattering or burning, over an alcohol lamp. Add 1 cc of phenoldisulfonic acid . . . and cover all the residue well by rotating the dish. Let stand about 5 minutes and add about 10 cc of water. Add clear 30 per cent NaOH . . . slowly until a yellow color persists. Make up to 20 cc and compare with the color standards for nitrate nitrogen.

"Permanent color standards for nitrate nitrogen.—Dissolve 0.3609 g of KNO_3 in distilled water and make up to 1,000 cc. One cc of this solution contains

0.05 mg of nitrate nitrogen, and 0.1 cc corresponds to 50 p. p. m. of nitrate nitrogen in the plant tissue, if 0.1 g of plant tissue is represented. If the extract from 0.2 g of tissue has been used, the color will represent 25 p. p. m.; if 0.4 g of tissue was required, the color represents 12.5 p. p. m., etc."

If the color of the extract interferes with accurate reading, grind 5 g of the tissue with about 0.5 g of calcium hydroxide, add 10 cc of 2 per cent copper sulfate solution, mix well, let stand about 5 minutes, and filter. It is noted that this filtrate, though usually clarified satisfactorily for the nitrate determination, is not suitable for use in the phosphate test.

"Phosphate test.—Put sufficient plant extract (usually 0.2–2 cc) to give a good color into a 10-cc graduate. Make up to about 7 cc with water. Add 1 cc of molybdate solution . . . and 0.5 cc of aminonaphthol sulfonic acid. . . . Make up to 10 cc, mix, and allow to stand 10 minutes before comparing with the color standards for phosphorus.

"Temporary phosphate phosphorus color standards.—Dissolve 0.1097 g of KH_2PO_4 in distilled water and make up to 2,500 cc. One cc of this solution contains 0.01 mg of phosphate phosphorus and 0.1 cc represents 10 p. p. m. of phosphate phosphorus in the plant tissue, if 0.1 g of plant tissue is represented. If 0.2 g of tissue has been used, the color represents 5 p. p. m., etc." Description is also given of a set of permanent standards.

"Potassium test.—Put sufficient plant extract (usually 0.5–2 cc) to cause an appreciable reduction of color of the potassium reagent into a 25-cc evaporating dish and evaporate almost to dryness, without spattering or burning. Add 0.3 cc of sodium cobaltinitrite . . . , cover all the residue by rotating the dish, and allow to stand about 5 minutes. Make to 10 cc, in a 10-cc graduate, with sodium nitrite solution. . . . After the precipitate settles, compare with the color standards for potassium. The comparison may be made immediately by filtering off the precipitate on a dry filter. The lighter the color the greater the amount of potassium. If the solution is nearly colorless, another test should be made, using less plant extract.

"Temporary potassium standards.—Dissolve 1.2929 g of KNO_3 in distilled water and make up to 250 cc. One cc of solution contains 2 mg of potassium and 0.3 cc represents 600 p. p. m. of potassium in the plant tissue, if 1 g of plant tissue is represented. If 2 g of tissue has been used, the color represents 300 p. p. m., etc." Permanent standards dependent on the similarity of color of solutions of ferric chloride in concentrated hydrochloric acid to the colors of the sodium cobaltinitrite solutions are also described.

The results of tests of the accuracy of these methods are given.

A test for replaceable and water-soluble potassium in soils, R. H. BRAY (*Jour. Amer. Soc. Agron., 24 (1932), No. 4, pp. 312–316*).—A cobaltinitrite-turbidity measurement carried out on a sodium acetate-dilute nitric acid extract of the soil is described in a contribution from the Illinois Experiment Station.

The method requires the following reagents: Reagent A—dissolve 1,000 g of C. P. sodium acetate in 1,600 cc of water. Mix seven parts of this solution with 3 parts of 1 : 1 nitric acid to make reagent A. Reagent B—a cobaltinitrite solution is made from 50 g of cobalt nitrate and 300 g of sodium nitrite dissolved in water acidified with 25 cc of acetic acid, and made up to a liter with water. The solution is allowed to stand for 24 hours and is then filtered. Reagent C consists of 95 per cent ethyl alcohol.

"Two and one-half g of air-dried soil are placed in a small beaker with a measured amount of reagent A. The mixture is stirred for 0.5 minute and filtered through a dry 7-cm quantitative filter paper. One cc of the filtrate is measured into a small flat-bottomed vial of the same size as used in standardizing the turbidity chart. Four drops of reagent B (20 drops = 1 cc) are added,

mixed, and then 1 cc of reagent C is slowly added down the side of the inclined vial so that very little mixing takes place. The vial is then gently shaken, thus slowly mixing the two solutions. When thoroughly mixed, the solution is allowed to stand for 1 minute before reading the precipitate on the turbidity chart. The directions for adding and mixing the reagents should be closely followed."

The standardization and use of the turbidity chart used with this method are described, and results obtained with soils of known replaceable potassium content are given.

Volumetric determination of pentoses and pentosans, G. M. KLINE and S. F. ACREE (*[U. S.] Bur. Standards Jour. Research, 8 (1932), No. 1, pp. 25–35*).—The results of a study of the standard and steam distillation procedures for the formation and separation of furfural from xylose, a comparison of the volumetric bromine methods and the gravimetric thiobarbituric acid method for determining furfural, and the effect of various chemical substances and experimental conditions on the yield of furfural are discussed.

Steam distillation gave no better yields of furfural from xylose than did the standard method of distillation.

The excess bromine titration method for determining furfural distilled from pentoses and pentosans was found to have the advantages of speed and accuracy over wide ranges of concentration. It is suggested that this method is worth considering as a possible Official method.

Nitric acid or nitrates in the distillation mixture destroyed furfural. This loss could be reduced greatly by a preliminary removal of nitrates with nitron.

"It is felt that the phase of this subject needing most attention at this time is the study of the best conditions for the conversion of the pentose or pentosan into practically 100 per cent of furfural. The yields are too low and variable at present."

A colorimetric method for the quantitative determination of glycine [trans. title], G. KLEIN and H. LINSER (*Hoppe-Seyler's Ztschr. Physiol. Chem., 205 (1932), No. 5–6, pp. 251–258, fig. 1*).—To 10 cc of an aqueous solution of the glycine add 15 cc of a mixture of 25 parts of a M/15 phosphate buffer of pH 8.0 and 75 parts of the special reagent described below, and shake well. After exactly 2 minutes add 35 cc of a mixture, freshly prepared, of 5 parts of concentrated sulfuric acid and 30 parts of 96 per cent alcohol and again shake thoroughly. After a further 2 minutes mix with 30 cc of chloroform. Separate the chloroform layer from the supernatant solution in a separatory funnel. To 5 cc of the chloroform extract add 1 cc of alcohol (to clear up the turbidity which could not otherwise be removed) and compare the green color of the resultant clear solution with that of a suitable standard in a colorimeter. A form of the procedure in which 0.5 cc of a water solution of the glycine constituted the sample permitted the determination of 0.15 mg of the amino acid.

The special reagent used in the determination was made by boiling under a reflex condenser 10 g of orthotetrabromo-orthoxylol [reference is evidently made to the compound brominated in the side-chains: $o\text{-}C_6H_4(CHBr_2)_2$] and 9 g of crystalline potassium oxalate with 62 cc of water and as much 95 per cent alcohol, from which mixture 50 cc of the alcohol is distilled off. Then add 10 g of sodium phosphate and 300 cc of water, distill off 300 cc of the liquid, and dissolve in it the phthalaldehyde crystallized out in the condenser. This solution is preserved in brown bottles for use in the above reaction.

Of amino acids other than glycine, only tryptophane was found to interfere with the determination. Ammonia also interfered.

The chemical analyses of some important baking ingredients, A. W. MEYER (*Cereal Chem., 8 (1931), No. 6, pp. 482–495*).—The paper consists essentially of a compilation of methods under the following heads: General meth-

ods, quantitative methods for determining the mineral content of the ash in yeast foods and flour improvers, detection and determination of oxidizing agents, general reactions which indicate the presence of oxidizing agents, detection and determination of individual oxidizing agents, and yeast food fillers.

The relation between total protein, peptizable protein, and loaf volume as obtained by successive increments of potassium bromate, R. H. Harris (*Cereal Chem., 9 (1932), No. 2, pp. 147–156*).—Four flours of widely different protein contents gave higher loaf volumes when diastatic malt was used with successive increments of 1 mg of potassium bromate than when the bromate was used without malt. On the basis of the procedure which gave the largest loaf volumes a series of 15 flours was baked, with the use of a basic method and of the basic method modified by the addition of 1 per cent of diastatic malt and 1 to 4 mg of potassium bromate. "The higher protein flours reacted most vigorously to the higher concentrations of potassium bromate. With the higher protein content flours, a progressive increase in loaf volume was noted with increasing protein content for each concentration of bromate up to and including 3 mg of potassium bromate.

"Correlation constants computed between flour protein and loaf volume obtained by the use of different amounts of potassium bromate in the test bake revealed higher values for the constant when 2 mg or more of potassium bromate were used. These values did not differ significantly, however, when the Z test for significance was applied. . . .

"A statistical treatment of the baking and extraction data showed very high positive significant correlations between nonextracted protein and loaf volume. No very great trend was evident toward increasing importance of extracted protein with increasing peptizing ability of the medium. The constants obtained by splitting the protein into fractions and computing their relationship with loaf volume showed no greater utility than when crude protein alone was considered."

A method for quick ashing of flours, J. W. Bowen (*Cereal Chem., 9 (1932), No. 2, pp. 158–160*).—Essentially, the method described consists in ashing partially at a muffle temperature reaching but little more than a dull red heat, cooling the crucible, treating the material with a small quantity of nitric acid diluted 1+19, evaporating the acid without boiling, and completing the ashing, as it was begun, at a low red heat. It is stated that "the resulting ash will be perfectly white and all traces of nitrate are expelled."

A simple method for determining the ash content of the flour in self-rising and phosphated flours, C. B. Gustafson (*Cereal Chem., 8 (1931), No. 6, pp. 475–481*).—The author of this contribution from the Indiana Experiment Station proposes a modification of the carbon tetrachloride test for the presence of added phosphate, the change having the purpose of making possible a quantitative separation of the added phosphates such as will permit a determination of the true ash of the original flour. Essentially, samples of from 20 to 25 g of the flour were weighed out and placed in centrifuge cups 2 in. in diameter and 6 in. deep, treated with carbon tetrachloride sufficient to fill the cups to about 1 in. from the top, and centrifuged for from 5 to 7 minutes at 1,600 r. p. m. The centrifuge was brought to rest slowly, the compact supernatant flour layer was skimmed off as nearly in one portion as possible, was allowed to dry overnight, and was examined for moisture and ash in the usual way.

A considerable number of comparative ash figures for plain flours and for the same flours after recovery by the method indicated from self-rising mixtures showed a very satisfactory agreement. Phosphated flours, compared with the natural flours from which they were made, gave similar results.

The determination of acidity in flours, A. Schulerud (*Cereal Chem.*, *9* (*1932*), *No. 2, pp. 128–136, figs. 3*).—The acidity of a flour suspension containing antiseptics was found to increase regularly to a definitely limiting value, this rise in acidity being proportional to the increase of soluble phosphates formed from organic phosphoric compounds by the action of water. The A. O. A. C. method is considered to give incorrect results, inasmuch as it "extracts phosphates not originally present as such." It was shown that in alcoholic solutions no acidic phosphates in addition to those already present in the flour will be formed. "On the contrary the original phosphates are not completely soluble in 85 per cent alcohol." Both the phosphates and the fatty acids were found easily soluble in 67 per cent alcohol, which appeared the proper concentration for the extraction of flour acids.

A method for determining flour acidity by extraction with 67 per cent alcohol is described. The results correspond quite well with acidities found by direct titration of flour suspensions.

AGRICULTURAL METEOROLOGY

Monthly Weather Review, [January–February, 1932] (*U. S. Mo. Weather Rev.*, *60* (*1932*), *Nos. 1, pp. 42, pls. 12, figs. 13; 2, pp. 43–81, pls. 11, figs. 11*).—In addition to detailed summaries of climatological data and weather conditions for January and February, 1932, solar and aerological observations, and bibliographical and other information, these numbers contain the following contributions:

No. 1.—Meteorological Conditions Affecting the Freeman Lake (Idaho) Fire, by G. M. Jemison (pp. 1, 2); Evaporation from Lakes and Reservoirs, by C. E. Grunsky (pp. 2–6); Relative Frequency of Centers of Cyclones and Anticyclones in the United States, by E. C. Miller (pp. 6–11); International Research Council—Third Report of the Commission Appointed to Further the Study of Solar and Terrestrial Relationships, by H. H. Kimball (p. 11); Sounding-Balloon Observations Made at Royal Center, Ind., during the International Month, February, 1931, by L. T. Samuels (pp. 12–22); Serious Erosion Caused by Heavy Rain of July 30, 1931, Near Colfax, Wash., by W. A. Rockie (pp. 22, 23); Storm Damage at Columbus, Ohio, January 26, 1932, by O. E. Russell (p. 24); and Stickel on the Measurement and Interpretation of Forest-Fire Weather in the Western Adirondacks, by W. R. Stevens (p. 25) (E. S. R., 66, p. 713).

No. 2.—A Rational Theory of the Cup Anemometer, by C. F. Marvin (pp. 43–56); Wet-Bulb Depression as a Criterion of Forest-Fire Hazard (pp. 56–59); A. Wagner's "Climatologie der Freien Atmosphäre," by J. C. Ballard (pp. 59, 60); and The Colder the Air the Thinner the Ice, by W. J. Humphreys (pp. 60, 61).

SOILS—FERTILIZERS

[Soil investigations], J. C. Ripperton, D. W. Edwards, and H. A. Wadsworth (*Hawaii Sta. Rpt. 1931, pp. 10, 32*).—The report on these includes notes concerning the soil survey of the Kona district, the relation of soil type to parent material, and the rate and height of capillary rise of water through soils.

[Soil investigations of the Iowa Station], P. E. Brown et al. (*Iowa Sta. Rpt. 1931, pp. 76–85, fig. 1*).—Brief notes are given on the effect of fertilizers on corn in the Wisconsin drift soil area, the effects of fertilizing materials and methods of grazing on permanent pastures, the effects of various amounts of fertilizers applied at different times in the rotation in the Wisconsin drift soil

area, the effect of various amounts of limestone of different degrees of fineness on the Tama silt loams, the relative value of red clover, alfalfa, and sweetclover as soil building crops, the effect of various fertilizing materials on crop growth on the Carrington loam, the Grundy silt loam, and various other soil types and on peat and muck, the value of commercial cultures for the inoculation of legumes and nonlegumes, the fixation of atmospheric nitrogen by nonsymbiotic microorganisms, nitrification in Iowa soils, the effects of fertilizers and various soil treatments on microorganisms, the occurrence and activities of fungi in Iowa soils, physiological studies on Rhizobium, the effects of liming and legume inoculation in southern Iowa, the effect of certain fertilizers on the composition of various crops, available phosphorus in Iowa soils, and the formation of humus and the decomposition of organic matter in soils.

[Soil and fertilizer researches of the Massachusetts Station], A. B. BEAUMONT, M. E. SNELL, M. H. CUBBON, J. E. FULLER, L. H. JONES, and F. W. MORSE (*Massachusetts Sta. Bul. 280 (1932), pp. 199, 200, 201, 228, 229*).—Data are reported on the magnesium requirements of crops; fertilizers for grasslands; nitrogen in golf green clippings; nitrogen fixation in the presence and in the absence of legumes; the utilization of mannite by Azotobacter; and the influence of temperature on the nitrate content of soil in the presence of decomposing cellulose.

[Soils and fertilizers], M. F. MILLER ET AL. (*Missouri Sta. Bul. 310 (1932), pp. 53–57*).—The results are noted briefly of work upon losses of nitrogen and organic matter through cropping, the relation of climatic nitrogen level to corn yield, soil erosion, the properties of colloidal material in Missouri soil, the use of finely ground limestone, increasing the productivity of Missouri pastures, the influence of nitrogen fertilizer on crop growth, methods of improving heavy clay subsoils, the relation of the plasticity number of soils to the clay content, an improved technic for measuring the upper plastic limit of soils, and crop rotation and fertilizer experiments.

[Soil and fertilizer investigations of the Nevada Station], R. STEWART, V. E. SPENCER, and G. HARDMAN (*Nevada Sta. Rpt. 1931, pp. 18, 19*).—Brief notes are presented on an attempt to determine the value of nitrogen in the unhumified soil organic matter of gypsum and of allied desert soils in the desert soils of the Las Vegas Valley, and on a study of the chemical and physical phenomena of the so-called "slick spots," impermeable areas in the gypsum soils and allied soils of the Moapa and Las Vegas Valleys of southern Nevada. They continue work already noted (E. S. R., 65, p. 720).

Seasonal subsoil temperature variations, A. SMITH (*Jour. Agr. Research [U. S.], 44 (1932), No. 5, pp. 421–428, figs. 3*).—The data recorded in the present contribution from the California Experiment Station continue similar experiments previously noted (E. S. R., 62, p. 505) and were obtained by means of electrical resistance thermometers "in an unirrigated area that was kept free from vegetation during the experiment and for 6 years before the experiment. The water table stood at a depth of 20 ft. During the wet season, September to May, the soil was generally moist to field capacity. During the dry season the greatest loss of moisture occurred from the surface foot of soil." The figures cover the depth range of 6 in. to 12 ft., and are detailed in graphic and in tabular form.

"The average monthly soil temperatures for depths ranging from 6 in. to 12 ft. show that during the early part of the year the upper subsoil has the lowest temperature and the subsoil is progressively warmer with the depth. Although the upper subsoil becomes progressively warmer in February, March, and April, the lower subsoil becomes progressively colder, attaining in April

its lowest average monthly temperature for the year. In April the average temperature (60° F.) is nearly the same for all depths from 1 ft. to 12. The upper subsoil continues to become warmer until July and then becomes cooler in August, while the deeper subsoil is warmer in August than in July. At a depth of 12 ft. the highest average temperatures occur in October and November. A 6-monthly symmetry is shown by the temperature waves."

Among other findings "the annual average soil temperatures for depths ranging from 6 in. to 12 ft. were found to vary from 65° to 67° F., while the annual mean air temperature, based on records obtained from minimum and maximum thermometers, was 58.8°."

Variations in moisture and nitrate content of field soils receiving different methods of cultivation, R. P. Bartholomew (*Arkansas Sta. Bul. 270 (1932), pp. 24, figs. 6*).—In a comparative study of seven cultivation methods there were found "no significant differences in the amounts of nitrates produced in soils on which the weeds had been destroyed by cultivation. However, when weeds were removed by scraping with a hoe the average nitrate content of the soil remained slightly higher than in other methods, because there was less loss of nitrates by leaching during the growing season. The nitrate and moisture content of the soils are greatly lowered, when weeds are permitted to grow, by utilization of those compounds by the weeds.

"Medium shallow cultivatiton until the corn tasselled, medium deep and deep methods of cultivation permit rapid absorption of moisture from limited rainfalls, whereas very shallow cultivation, scraped with a hoe, and no cultivation favored a rapid surface run-off of the rain. There was no difference in the moisture content of soils, when rainfall was plentiful and well distributed, when the methods of cultivation kept the soil free of weeds. Slight differences in amount of moisture conserved from evaporation by some methods of cultivation would have little effect, if any, on yields. . . .

"Large losses of nitrates may occur from the soil between the time the crop stops growing in the fall and the time a crop is planted in the spring. Nitrates are produced during warm periods in the winter months. Cover crops prevented loss of large quantities of available nitrogen and in addition added considerable active organic matter to the soil when plowed under in the spring."

Factors affecting the accumulation of nitrate nitrogen in high plains soils, H. H. Finnell (*Oklahoma Sta. Bul. 203 (1932), pp. 47, fig. 1*).—This study was undertaken at the Panhandle Station in 1923. The work here reported covers an attempt to discover and analyze some factors which govern nitrate accumulations in the topsoil, with preliminary observations on the movement of nitrates in the soil.

A biometric analysis of eight factors, for which 164 observations were available on heavy silt loam soil during 1924–1930, indicated that "rest period, or the interval of time between the last previous harvest and nitrate sampling, which in this group averaged 12.8 months with a coefficient of variability of 88, was the most important factor favoring nitrate accumulation. The distribution of effective rainfall was second in importance, as represented by the length of time next preceding the nitrate sampling which was required to supply an amount of effective rainfall sufficient to displace the topsoil moisture. The average for the group was 3.8 months, with the high coefficient of variability of 100.

"The number of excessive rains falling during the year (which roughly indicated the number of times the topsoil layer was leached) was third in

importance, affecting nitrate accumulation adversely. The average number of excessive rains during the period studied was 5.1 annually, with a coefficient of variability of 143. Of equal importance to the number of excessive rains was the amount of topsoil moisture present during the winter. High nitrate accumulations were associated with a high winter soil moisture, apparently as an index of reducing forces to which both nitrate and moisture were subject but which operated independently of the other factors studied. The mean winter topsoil moisture content was 16.6 per cent, with a coefficient of variability of 21.

"The moisture content of the topsoil at the date of the first killing frost in the fall averaged 16.8 per cent and was only slightly more variable than the winter moisture, with a coefficient of 24. This factor was positively associated with topsoil nitrate accumulation. Of equal importance to fall moisture content in relation to nitrate accumulation was the amount of cultivation given during the previous year. This was measured by taking the sum of the depths of all cultivations for the calendar year, and averaged 10.6 in. for the group, with a coefficient of variability of 47. It was a fairly independent factor in increasing nitrification.

"*Total yields removed from the plats and the amount of raw organic matter carried over from one year to another showed little independent effects upon nitrate accumulation under the conditions of this experiment.*"

Comparing the relation of certain factors under conditions of single cropping and rotation revealed that "the relative importance of the rest period was much emphasized by extending it from 6.5 months to 12.8, suggesting the acceleration of nitrification after a certain stage of the decay of raw organic residues had been reached. The heavier system of cropping practiced in the rotation experiments resulted in shifting some of the weight of influence governing nitrate accumulations from other factors to that of yields removed which exhibited a negative relationship.

"Simple crop history of strongly feeding crops which mature late in the fall constituted a better index of topsoil nitrate content which may be expected to pass the winter than any available statistical method of estimate derived from massed data. When the rest period was extended, or crops less exhaustive of soil resources were grown, the variation in topsoil nitrate accumulations became *greater, the final result being subject to more hazards than in the restricted* group.

"The variability in nitrate accumulation resulting from comparable methods was somewhat less under conditions of crop rotation than under single cropping."

Regarding the movement of nitrates in the soil, "*the downward movement of nitrates as a result of leaching appeared to be normally slow enough that* considerable balances of nitrate nitrogen remained in the surface and subsurface soil, and that the surface soil nitrate content corresponded with that of the soil at depths of 6–18 in. to an extent represented by the correlation coefficient 0.75±0.03. Although the majority of uncropped plats reached the end of the year with a maximum amount of nitrates to depths of 24 in., there was a considerable variation in the progress of nitrification as a result of variations in culture and cropping during the year 1929.

"Land producing a crop showed the highest nitrate concentrations at or soon after the beginning of the growing season. Nitrate concentrations observed at various points in the lower subsoil corresponded closely to the depths surface water, as shown by moisture records, had penetrated during the

preceding period. Crops known to be particularly exhaustive of soil nitrogen under semiarid conditions, such as sorghums grown in cultivated rows, were shown to allow regular leachings to take place beyond the depth of root growth as a result of manner of incidence of the growing season upon the normal moisture distribution. Extended fallowing permitted excessive leaching. Continuous wheat growing most effectively prevented leaching losses."

Electrodialysis as a measure of phosphate availability in soils and the relation of soil reaction and ionization of phosphates to phosphate assimilation, W. T. McGeorge (*Arizona Sta. Tech. Bul. 38 (1932), pp. 593–630, figs. 16*).—Electrodialysis appeared "an excellent means of dissolving the active or available forms of phosphate from calcareous soils with least interference from the calcium carbonate present." The rate of dissociation of soil-phosphate compounds was found to vary greatly with slight variations in amperage but was not materially modified by variations in voltage.

"By measuring the rate of ionization and making a colorimetric determination of phosphate in the anode chamber at definite intervals, a close agreement with degree of response to phosphate fertilization was noted in a selected group of Arizona soils as well as in soils from other parts of the United States. The method is sufficiently delicate to measure the increase in phosphate content of the soil following an ordinary application of phosphate fertilizer."

The results recorded indicate that sandy soils are lower in electrodiffusible phosphate than loams or clay loams; that noncalcareous and acid soils are usually lower in electrodiffusible phosphate than calcareous soils by reason of the fact that acid soils have become largely depleted of their phosphate, which is more soluble at this reaction; that at alkaline reactions soils require more soluble phosphate to supply the needs of the crop than do neutral or slightly acid soils; and that in acid soils available phosphate is present in largest part as the H_2PO_4 ion, while in alkaline soils HPO_4 is the important ion.

Since H_2PO_4 ion is the dominant ion in plant sap and crops subsist on lower concentrations of phosphate in the soil solution of slightly acid soils, it is suggested that the plants prefer the H_2PO_4 ion for nutrition purposes. It is shown that wheat plants assimilate phosphate most readily at reactions close to neutrality (preferably slightly acid), less readily at acid reactions in the presence of calcium, and least readily at alkaline reactions of pH 8 to 9. Phosphate assimilation is thus largely a function of reaction.

"Electrodiffusion of phosphate can be represented by a specific rate constant which is different for different soils and at different amperages."

A progress report on the phosphate deficiency of Montana soils, L. J. Nygard (*Montana Sta. Bul. 259 (1932), pp. 27, figs. 9*).—Trials with treble superphosphate on fields cropped to alfalfa and of various crops in irrigated regions widely scattered through the State and inclusive both of well-established irrigation culture and recently developed irrigation projects (E. S. R., 65, p. 19) showed a need for readily available phosphate in many cases. "Of 493 soil samples collected from cultivated fields in 1930, both under irrigated and dry farming, and tested by the Winogradsky (Azotobacter) test, 300 showed a deficiency in available phosphate. Only 12 showed a deficiency in available potash."

Fertilizer materials and mixed fertilizers, A. W. Blair (*New Jersey Stas. Bul. 541 (1932), pp. 40, figs. 11*).—The bulletin presents a general discussion of the functions of the principal fertilizer elements, their more common sources and the properties and plant-food content of these sources, and of ordinary and high-analysis and concentrated mixtures.

AGRICULTURAL BOTANY

The growth curve in barley, M. N. POPE (*Jour. Agr. Research* [*U. S.*], *44* (*1932*), *No. 4*, *pp. 323–341*, *figs. 10*).—In connection with a study of the catalase activity in relation to the growth of barley, it became desirable to study the growth curves of the barley plant.

Two varieties of barley were grown in plats and sampled daily from about the end of March until June 4, after which the period between samplings was extended to two or more days. Only that portion of the plant above the seed was used. Data were secured on height growth and on fresh and dry weights of the plants.

It was found that the growth curve of the barley shoot without kernels is typically sigmoid, with certain slight variations from a perfectly smooth curve in both early and late stages. Such a curve is considered to offer a composite picture of the grand periods of growth of all the organs and also of each individual cell in the measured individual.

Variations in the curve of early growth are associated with definite events in the development of the plant. Evidence was secured to support the hypothesis that the structural inability of the existing roots to absorb nutrients is the factor inhibiting growth in length, since this inhibition was removed as soon as new roots were formed and became functional. Growth rate in both length and weight was retarded at about the time the first tillers were appearing and before their roots were established. When tiller roots became functional, the curve rose more rapidly. The curve of leaf length reached inflection at about first flowering, but the curves of awn-tip length and total length of shoot reached inflection 5 days later in the variety Tennessee Winter and from 8 to 10 days later in Hannchen.

The curve of shoot weight, excluding kernels, showed inflection 4 days after flowering in Tennessee Winter, and from 10 to 12 days after flowering in Hannchen. The total weight of the shoot, including kernels, increased at a regular rate until about the hard-dough stage of the kernel was reached, when the leaves and awns had begun to die. After the hard-dough stage the shoot lost weight on account of mechanical breakage and leaching by rain.

Indirect evidence indicates that growth rate in the plant varies with the accessibility of nutrients and the structural ability of the plant to translocate them and utilize them in growth.

Catalase activity in relation to the growth curve in barley, M. N. POPE (*Jour. Agr. Research* [*U. S.*], *44* (*1932*), *No. 4*, *pp. 343–355*, *figs. 7*).—During the study of the growth curve of barley noted above a parallel investigation was made upon catalase activity.

Four series of daily determinations of catalase activity were made during the growth period of Hannchen barley in field plat and greenhouse. The first series was carried through to the mature plant, while in the other three series the studies were continued through the period of early growth, where the results were most variable. Catalase activity, as represented by the cubic centimeters of oxygen gas liberated per unit of dry weight, was found roughly proportional to the reciprocal of growth rate. The curve of catalase activity showed three peaks, each occurring at the time of inception of a new and definite stage in the functional activity of the plant.

Pseudomedullary rays in pine [trans. title], [C.] VON TUBEUF (*Ztschr. Pflanzenkrank. u. Pflanzenschutz*, *40* (*1930*), *No. 8*, *pp. 353–356*, *figs. 3*).—Following up the statement previously noted (E. S. R., 66, p. 622), the author states that the pines affected show no injurious disease similar, for example,

to crown gall caused by *Bacterium tumefaciens*. No injury due to animal or mechanical causation was found. The possible causal relationship of this with other growth anomalies referred to is discussed.

Germinability and hydrogen-ion concentration in relation to size of seed [trans. title], C. LA ROTONDA (*Ann. Tec. Agr., 3 (1930), No. 3, I, pp. 409–421*).—Experimentation is described with tabulations of data as accomplished with *Trifolium pratense, Hedysarum coronarium, Vicia faba major, V. faba minor, Phaseolus lunatus, P. vulgaris, Dolichos unguiculatus, Triticum vulgare, Hordeum vulgare*, and *Phleum pratense*. Bearings, difficulties of interpretation, and special cases are indicated.

On the change of substances in the leaves of cultured plants during vegetation [trans. title], P. S. ERYGIN (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 7 (1930), No. 4, pp. 280–296; Eng. abs., pp. 295, 296*).—Observations and calculations therefrom on sunflower, maize, bean, tobacco, and beet gave data which are detailed and discussed as regards water, dry matter, and nitrogen (total, protein, ammoniacal, amide, and amino acid) per unit leaf area on different parts of the leaf at different levels of the plant and at different growth stages.

Is bacterial association a factor in nitrogen assimilation by rice plants? J. SEN (*Agr. Jour. India, 24 (1929), No. 4, pp. 229–231*).—"This demonstration of an occurrence of symbiotic nitrogen-fixing organisms within the roots of the rice plant throws new light on the problem of nitrogen nutrition of rice and opens out many interesting lines of study. Pure cultures are being isolated, the investigation of which, as well as that of the crude cultures and of their relationship to the plant, is being continued."

The kinetics of penetration.—II, The penetration of CO_2 into Valonia, A. G. JACQUES and W. J. V. OSTERHOUT (*Jour. Gen. Physiol., 13 (1930), No. 6, pp. 695–713, figs. 8*).—In a previous paper (E. S. R., 61, p. 513) containing reference to previous work on the penetration of living cells by weak acids, it was shown that in the cells of *V. macrophysa* the undissociated carbon dioxide very soon comes into equilibrium with that in the sea water outside. This did not, however, show in what form the carbon dioxide penetrates, and the time curves of its penetration into living cells of Valonia at low and at high pH values have been studied.

The time curve of penetration appears to be of the first order, but with a "velocity constant" which falls off from the start. The evidence indicates but little penetration of ions. This is shown by the similarity of velocity constants at high and at low pH values and by the penetration rate, which remains constant so long as the external concentration of undissociated carbon dioxide remains constant, regardless of the variation in concentration of ions.

The direct current resistance of Valonia, L. R. BLINKS (*Jour. Gen. Physiol., 13 (1930), No. 3, pp. 361–378, figs. 6*).—"A direct current bridge with vacuum tube detector is described for measuring the resistance of living cells. Methods for evaluating the surface of contact with the protoplasm, and the leakage around the cell wall, allow us to calculate the effective resistance of the protoplasm. In *Valonia ventricosa* this is usually at least 10,000 ο per square centimeter and is often much higher. This is in agreement with the very slight ionic interchange observed in normal Valonia."

The internal mechanism of photoperiodism, A. E. MURNEEK (*Missouri Sta. Bul. 310 (1932), pp. 44, 45*).—The relative content of chlorophyll, xanthophyll, and carotene in cosmos, salvia, and soybeans exposed to 7-hour and 14-hour days is reported.

Distribution and isolation of hemicellulose cleaving enzymes in seeds, F. GERHARDT (*Iowa Sta. Rpt. 1931, pp. 52, 53*).—A brief progress report in which are shown analyses as to the percentage composition of various seeds.

The relation of mycorrhizae to conifer seedlings, R. E. McARDLE (*Jour. Agr. Research* [*U. S.*], *44* (*1932*), *No. 4, pp. 287–316, pls. 2, figs. 7*).—The results are given of a field study of mycorrhizae made in several plantations of conifers which included the seasonal occurrence of mycorrhizae, the various types found, the pH values for soil and humus, and a microscopic examination of a very large number of mycorrhizae.

By means of a technic devised for successfully forming mycorrhizae on the roots of seedlings grown under controlled conditions, such formations were brought about repeatedly on the roots of northern white pine and Norway spruce seedlings in syntheses with *Tricholoma personatum, Lycoperdon gemmatum, Clitocybe rivulosa angustifolia*, and *C. dealbata*. Eight other species are suspected of forming mycorrhizae on northern white pine and Norway spruce.

Mycorrhizae were formed in cultures where nitrogen was supplied by inorganic compounds (nitrates) and in cultures where nitrogen was supplied in organic compounds (asparagine, uric acid, glycine, and peptone). Mycorrhizae were also formed in cultures where no nitrogen was included in the nutrient solution.

No conclusive proof was obtained to show that the presence of mycorrhizae on the roots of white pine and Norway spruce seedlings is either helpful or harmful to the seedlings. The formation of mycorrhizae was found to depend on the contact of the right species of fungus mycelium with a growing root tip. No penetration of fungus hyphae was found in the older roots.

Note on the nature of the current of injury in tissues, W. J. V. OSTERHOUT and E. S. HARRIS (*Jour. Gen. Physiol., 13* (*1929*), *No. 1, pp. 47–58, figs. 15*).—The current of injury in living cells is said to have been found by previous workers to be uniformly negative, but experiments by the authors on Nitella have indicated that it could be rendered either positive or negative according to the method of treatment. The authors have investigated whether this divergence in result could have been due, respectively, to the use of cells or of tissues as experimental material. Particulars are given.

A chemical method of detecting injury to plants due to asphalt or tar [trans. title], K. DVOŘÁK (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 40* (*1930*), *No. 11, pp. 505–510*).—It is claimed that by the method here described injury of plants due to tar or asphalt can be detected, though otherwise no changes are actually visible.

A compilation of culture media for the cultivation of microorganisms, M. LEVINE and H. W. SCHOENLEIN (*Baltimore: Williams & Wilkins Co., 1930, pp. XVI+969*).—A search has been undertaken of the literature of the subject for the widely scattered contributions relating to the various substances and media used for the cultivation of bacteria, yeasts, and molds, and formulas for about 7,000 media proposed are indicated. It is thought that the system of classification of the media, together with the arrangement of the keys and indexes, should make possible a ready review of the media as proposed for growing different types and as composed of different ingredients.

The primary subdivisions into groups based on the physical characters and the nature of the solidifying agent are considered as logical from the standpoint of history and that of utility. The secondary subdivisions based upon the chemical characters of the constituents are considered as consonant with

the modern trend toward emphasis upon the physiology and metabolism of the microorganisms.

Notes on the technique of measuring the growth of bacteria with a nephelometer, M. W. COLLEY (*Amer. Jour. Bot., 18 (1931), No. 3, pp. 205–210*).—These notes present certain points relative to the use of the nephelometer in measuring the turbidity of bacterial cultures, particulars regarding which are set forth in the article noted below.

Culture experiments with Pseudomonas tumefaciens, M. W. COLLEY (*Amer. Jour. Bot., 18 (1931), No. 3, pp. 211–214, fig. 1*).—These notes are based on the results of some preliminary experiments undertaken to find the optimum conditions for the growth of *P. tumefaciens* in a liquid synthetic medium consisting of monobasic potassium phosphate (Merck's Sorensen's) 0.5 g, magnesium sulfate 0.2 g, dextrose (bacto) 1.0 g, asparagine 1.0 g, and water making up to 1,000 cc. Curves are shown.

Studies in sugarcane pollen with special reference to longevity, N. L. DUTT (*Agr. Jour. India, 24 (1929), No. 4, pp. 235–244, pls. 2, fig. 1*).—"Sugarcane pollen studies have a direct bearing on the problems connected with sugarcane breeding."

Sugarcane pollen germinated in sugar concentrations throughout a rather wide range, or in distilled water or else in filtered rain water. The best germinations were obtained by the use of 26 per cent commercial sugar with 0.7 per cent shred agar. Under favorable conditions the pollen tube reached the ovary in 3 to 4 hours. Mauritius 131 pollen was kept alive in storage for 12 days in an atmosphere of carbon dioxide at a relative humidity of 85 per cent and at temperatures of 5 to 13° C.

A photographic light box for use in agricultural research, A. B. GROVES (*Jour. Agr. Research [U. S.], 44 (1932), No. 5, pp. 467–475, pls. 2, figs. 3*).—A description is given of a light box devised at the Virginia Experiment Station that is said to provide suitable illumination for photographing diseased fruits and similar specimens.

It is claimed that this light box has also proved to be useful in lantern-slide production, natural-color photography, and in low-power photomicrographic work where upper-field illumination is desired.

GENETICS

Chromosomes in grass sorghums, A. E. LONGLEY (*Jour. Agr. Research [U. S.], 44 (1932), No. 4, pp. 317–321, figs. 3*).—The haploid numbers of annual grass sorghums including Sudan grass (*Sorghum sudanensis*), tabucki grass (*S. verticilliflorum*), *S. virgatum*, *S. drummondii*, *S. hewisoni*, and *S. arundinaceum* were determined to be 10, *S. versicolor* 5, and *S. purpureo-sericeum* 20, and of the perennial Johnson grass (*S. halepense*) 20. "If the chromosomes of the perennial sorghums represent a duplication of the chromosome set found in annual forms, as seems to be the case in perennial teosinte, it indicates that the perennial plants have been derived from annual ancestors having 10 chromosomes."

Chromosome numbers in Phlox, W. S. FLORY, JR. (*Amer. Nat., 65 (1931), No. 700, pp. 473–476*).—Results are presented of chromosome studies conducted at the University of Virginia with 26 varieties of phlox distributed among 14 species. With one or two exceptions there were found 7 haploid and 14 diploid chromosomes. The two aberrant forms were *P. adsurgens* with 20+ diploid chromosomes and *P. diffusa* with 28 diploids.

Inheritance in barley, D. W. ROBERTSON, G. W. DEMING, and D. KOONCE (*Jour. Agr. Research [U. S.], 44 (1932), No. 5, pp. 445–466*).—Continued inheritance studies with barley (E. S. R., 64, p. 24) by the Colorado Experiment Station explained on a simple Mendelian basis the inheritance of the character pairs green v. chlorina seedlings (*Ff*) in Minnesota 84–7, green v. virescent seedlings (*Yy*) in Minnesota 72–8, and blue v. nonblue aleurone (*Bl bl*). A 2-factor difference explained the difference between rough and smooth awns (*Rr R'r'*).

The factor pair *Ff* was found to be inherited independently of the pairs $A_t a_t$ for green v. white seedlings in Trebi, $A_c a_c$ for green v. white seedlings in Colsess, $F_c f_c$ for green v. chlorina seedlings in Colsess, *Ss* for long v. short-haired rachilla, and *Kk* for hoods v. awns. $X_c x_c$ for green v. xantha seedlings in Colsess was inherited independently of *Yy* and *Bl bl*. *Bl bl* was inherited independently of *Ss*. The factor pair *Bb* for black v. white glumes was inherited independently of *Rr R'r'* and *Gg G'g' G'' g''* for branched v. unbranched style. *Ss* seemed to be inherited independently of *Gg G'g' G''g''*, which was explained on the hypothesis that the factors may be located at the extreme ends of the chromosome.

Linkage was observed between *Ff* and *Vv* for non-6-rowed v. 6-rowed with a crossover value of 18.3 per cent; $F_c f_c$ and $Y_c y_c$ for green v. virescent seedlings in Coast with a crossover value of 29.3 per cent; *Bl bl* and *Kk* with a crossover value of 22.58 per cent; and *Ss* and *Rr* with a crossover value of 34.63 per cent. An indication of possible linkage between the rough-awn factor pair and some of the factors for branched and unbranched style was also noted.

Inheritance of characters in rice, Part IV, K. RAMIAH, S. JOBITHARAJ, and S. DHARMALINGA MUDALIAR (*India Dept. Agr. Mem., Bot. Ser., 18 (1931), No. 8, pp. [2]+229–259, pls. 7, figs. 3*).—The fourth contribution of this series (E. S. R., 65, p. 522) reports results showing that the glutinous and the nonglutinous characters of the rice endosperm form a simple pair of allelomorphs. It appeared that some inherent defect exists in the glutinous gene and that environmental conditions can affect its expression, and that the glutinous endosperm character of the grains is related to the vigor of the seedlings they produce. The glutinous endosperm was found to be closely linked with one of the two main pigment complementary factors responsible for the pigment at the leaf axil and palea tip.

Round short grains were found to be a simple dominant to the ordinary coarse long type. The factor or factors responsible for the spikelet lengths differ from that deciding shape, but the two may be associated, in which case the short spikelet length behaves as a simple dominant to the long. Segregation might occur either for shape only or for spikelet length. In the varieties studied one-factor differences were suggested for lax v. dense panicles, clustering v. nonclustering character of spikelet or panicle, ordinary v. long outer glume, and mottling v. even dirty. Dihybrid ratios were indicated for dense arrangement v. clustering of spikelet in the panicles.

As to brown rice, the results showed that the relation between purple rice and brown rice is the same as between red rice and gray brown rice. The pigmentation factor *A* and the purple-rice factor *P* are both necessary for the production of purple rice, and in the absence of *A*, *P* produces brown rice.

Interspecific hybridization in Nicotiana.—VII, The cytology of hybrids of the synthetic species digluta with its parents glutinosa and tabacum, R. E. CLAUSEN (*Calif. Univ. Pubs. Bot., 11 (1928), No. 10, pp. 177–211, figs. 48*).—The seventh number of this series (E. S. R., 58, p. 125) is concerned with the cytological relations of *N. digluta* to its parental species *glutinosa* and *tabacum*, as exhibited in F_1 hybrids, and with the mode of distribution of chromosomes

in such hybrids as evidenced by individual studies of chromosome numbers in their progenies.

Interspecific hybridization in Nicotiana.—VIII, The sylvestris-tomentosa-tabacum hybrid triangle and its bearing on the origin of tabacum, T. H. GOODSPEED and R. E. CLAUSEN (*Calif. Univ. Pubs. Bot., 11 (1928), No. 13, pp. 245–256, pls. 2, figs. 7*).—The morphology and cytology of F_1 *N. sylvestris-tabacum*, F_1 *N. tomentosa-tabacum*, and F_1 *N. sylvestris-tomentosa* are described and discussed. The hybrid triangle appears of special interest because of the significance it may have for the origin of *tabacum*.

Interspecific hybridization in Nicotiana.—IX, Further studies of the cytology of the backcross progenies of the paniculata-rustica hybrid, W. LAMMERTS (*Genetics, 14 (1929), No. 3, pp. 286–304, figs. 14*).—The present paper, reporting more extended studies of the back-cross progenies (E. S. R., 56, p. 632), contains information as to the chromosome number of the functional female gametes produced by the hybrid.

Interspecific hybridization in Nicotiana.—X, Haploid and diploid merogony, R. E. CLAUSEN and W. E. LAMMERTS (*Amer. Nat., 63 (1929), No. 686, pp. 279–282, figs. 6*).—A single haploid *tabacum* plant appeared in an F_1 population from *N. digluta* ♀ × *N. tabacum* ♂. It was suggested that the occasional pure *sylvestris* plants obtained in back-crosses of F_1 *sylvestris-tabacum* ♀ × *sylvestris* ♂ may arise from diploid merogony. No influence of maternal cytoplasm was discernible in the instances described.

[Breeding experiments at the Missouri Experiment Station] (*Missouri Sta. Bul. 310 (1932), pp. 15–18*).—Brief results are given of studies of the optimum time to breed gilts and ewes, color inheritance in swine, and overcoming breeding difficulties in boars by hormone treatment, by F. F. McKenzie; oestrum, the length of the oestrous cycle, nutrition and the breeding season, two causes of infertility, the period of gestation, and fertility in sheep, by McKenzie and R. W. Phillips; and studies of the ovaries and tubal ova of the ewe, by McKenzie, Phillips, E. Allen, J. W. Kennedy, and W. K. Beare.

The inheritance of body weight in the domestic fowl, M. A. JULL and J. P. QUINN (*Jour. Heredity, 22 (1931), No. 9, pp. 283–294, figs. 6*).—An account is given of the weights at 30 weeks of age of the parents and the F_1 and F_2 progeny of crosses of Barred Plymouth Rocks and Rose-Comb Black Bantams made at the U. S. Animal Husbandry Experiment Farm, Beltsville, Md. The Barred Plymouth Rock males ranged in weight from 2,718 to 3,680 g and the females from 2,401 to 3,397 g, while the Bantam males ranged in weight from 640 to 895 g and the females from 465 to 950 g. On account of the great size variation it was necessary to employ artificial insemination in making the crosses. The F_1 and F_2 progeny were intermediate in size between the parents but nearer the weight of the Bantam parent than the larger parent. The F_2 progeny showed greater variability than the F_1s, but none of the F_2s were as large as the smallest Barred Plymouth Rock parent or as small as the largest Bantam parent used in the original cross. The failure of any extremes occurring in the F_2 population of 124 does not indicate a Mendelian mode of inheritance for body weight.

A new mutation to "dominant spotting" (*W*) in the house mouse, C. E. KEELER (*Jour. Heredity, 22 (1931), No. 9, pp. 273–276, figs. 2*).—An account is given of the occurrence of a mutation to dominant spotting in a strain of unspotted black silver mice. On genetic test the mutation was found to be identical with the gene for dominant spotting *W* already known. The homozygous dominant form was lethal, and in combination with recessive spotting produced black-eyed whites.

A cross between mice with different numbers of tailrings, A. B. D. FORTUYN (*Genetics, 16 (1931), No. 6, pp. 591–594, fig. 1*).—An inbred strain of black mice having an average of 172.02±0.47 tail rings was crossed with an inbred strain of pink-eyed dilute brown mice having an average of 205.41±0.46 tail rings. The number of tail rings in the hybrids was intermediate between the two parents. There was some tendency for the hybrids produced by mothers from the two different strains to vary slightly in accordance with the strain from which the dam came. A back-cross population was also produced which surprisingly showed no greater variability than was shown by the parents. Although eight color types were produced among the back-cross individuals, no relationship between the number of tail rings was observed.

Zebu-yak hybrids, M. M. ZAWADOWSKY (*Jour. Heredity, 22 (1931), No. 10, pp. 296–313, figs. 17*).—The F_1s and back-crosses between the zebu and yak produced in the Moscow Zoological Park, together with the inheritance of certain character differences, are described. In both the F_1 and back-cross generations the males are sterile and the females are fertile. Histological study of the testicles of the hybrid animals showed that the normal spermatozoa are not produced, but that the interstitial tissue is well developed. The F_1 hybrids were larger than either parent and showed the black-brown coat color of the yak, which behaved as a simple dominant to the gray color of the zebu. The long-haired tail of the yak was dominant over the zebu type of tail, but was also influenced by the completely recessive factor for the long hair of the yak. The long bony form of the body of the yak was dominant over the square body form of the zebu. The shape of the hump of the yak was dominant over that of the zebu. At least two pairs of factors determined the shape of the horns, and the F_1s showed a new horn formation. An intermediate type of muzzle was also observed in the hybrids. The absence of the fringe, as occurs in the zebu, was dominant over the presence of the fringe of hair occurring around the abdomen in the yak. Hairlessness was dominant to the hair character occurring in other cattle.

[Mammary gland studies at the Missouri Experiment Station] (*Missouri Sta. Bul. 310 (1932), pp. 24–27, fig. 1*).—Brief notes are given of findings in studies of the growth of the mammary glands, by C. W. Turner and A. H. Frank; the initiation of milk secretion, by Turner and W. U. Gardner; and the fetal development, histological structure, and development of the mammary gland as indicated by the initiation and increase in the yield of secretion, by Turner.

The follicle-stimulating effect of pig anterior lobe on the monkey ovary, C. G. HARTMAN and R. R. SQUIER (*Anat. Rec., 50 (1931), No. 3, pp. 267–273, figs. 6*).—Transplantation of two anterior lobes of the hypophysis of pigs on three successive days into two adult monkeys caused growth of the follicles, but no luteinization occurred. The ovaries and the uterus were extremely vascular, and the Graafian follicles were in the process of atresia.

Some effects of ovariectomy upon breeding females, W. S. MURRAY (*Science, 75 (1932), No. 1955, pp. 646, 647*).—The incidence of mammary carcinoma in mice was related to an ovarian influence, as ovariotomy of breeding females at seven months of age reduced the number dying from cancer and increased the expectation of life.

FIELD CROPS

[Farm crops experiments in Iowa], J. M. AIKMAN, C. S. REDDY, L. C. BURNETT, R. H. PORTER, C. M. KING, A. L. BAKKE, J. L. ROBINSON, J. B. WENTZ, H. D. HUGHES, M. T. JENKINS, R. W. JUGENHEIMER, A. A. BRYAN, W. G. GABS-

LER, F. S. WILKINS, P. E. BROWN, F. B. SMITH, E. V. COLLINS, C. Y. CANNON, E. R. HENSON, E. W. LINDSTROM, and F. G. BELL (*Iowa Sta. Rpt. 1931, pp. 40, 41, 42, 43, 44, 50, 62–76, 87, 88, figs. 2*).—These pages report the progress (E. S. R., 65, p. 124) of breeding work with corn, wheat, and reed canary grass; variety trials with corn, oats, wheat, alfalfa, red clover, soybeans, and sorgo; tests of legumes and grasses for hay and pasture; variety-cultural experiments with oats and wheat; variety and seed treatment tests with barley and flax; cultural studies with reed canary grass (E. S. R., 67, p. 128); tests of the winter resistance of winter rye and wheat; seeding, cultivation, and cutting experiments with alfalfa; curing and storage studies with alfalfa hay; the relation of moisture to respiration in stored oats; trials of nurse crops for small seeded legumes; trials of legumes for green manure; studies of the effects of Sudan grass, in rotation, on yields of corn; tests of agricultural seed for purity and germination; a study of the annual spread and eradication of creeping Jennie and leafy spurge; and eradication of biennial sweet clover.

Other investigations with corn were concerned with genetic interrelations and prepotencies of inbred lines; the relation of time of planting to yield and quality of produce among crosses between inbred lines; comparison of inbred lines of corn obtained from open-pollinated varieties and from crosses between inbred lines; corn improvement through the use of inbred lines; the relation between the corn kernel and its seed value; ear and kernel characteristics of seed corn in relation to yield; the measurement of the environmental factors in the growth of the corn plant at different rates and spacings; correlation between composition and stiffness of stalk in the corn plant; rate, date, and method of planting varieties of corn differing in maturity; a study of varieties and strains of corn in different parts of Iowa; and a statistical study of the relation of size and shape of plat and number of replications to precision in yield comparisons with corn.

[**Crop production experiments in Massachusetts**], A. B. BEAUMONT, E. F. GASKILL, W. L. JONES, E. A. HOLLOWELL, M. E. SNELL, W. S. EISENMENGER, R. W. DONALDSON, L. S. DICKINSON, J. B. LINDSEY, E. B. HOLLAND, and E. BENNETT (*Massachusetts Sta. Bul. 280 (1932), pp. 195, 196, 198, 199, 200, 228*).—The progress of agronomic experiments (E. S. R., 65, p. 330), including variety tests with alfalfa, red clover, sweetclover, vetch, field peas, and soybeans; pasture investigations, including timothy and Jerusalem-artichoke; method of applying fertilizer to corn; and tests of lawn fertilization and management, is reviewed again. Tobacco investigations (E. S. R., 65, p. 337) reported on briefly dealt with cropping systems, nitrogen metabolism in the plant, quantities and carriers of nitrogen fertilizer, methods of applying fertilizer, and the effect of cultural and fertilizer treatments on the nitrogen compounds and on the total yield, grade, and market value of Havana seed tobacco.

[**Field crops experiments in Missouri, 1930–31**], L. J. STADLER, R. T. KIRKPATRICK, W. R. TASCHER, B. M. KING, C. A. HELM, T. J. TALBERT, and W. L. TAYLOR (*Missouri Sta. Bul. 310 (1932), pp. 34–38, 45, 46*).—Research with field crops briefly reported on again (E. S. R., 66, p. 325) comprised genetic studies with corn (E. S. R., 66, p. 321) and barley, especially in regard to the effects of irradiation; breeding work with corn, wheat, oats, soybeans, and potatoes; variety tests with corn, cotton, wheat, oats, barley, grain sorghum, soybeans, potatoes, and sweetpotatoes; fertilizer tests with cotton and potatoes; and a comparison of grain sorghum and corn for grain and forage production.

Annual hay crops, H. B. SPRAGUE, N. F. FARRIS, N. J. CURTIS, and W. G. COLBY (*New Jersey Stas. Bul. 540 (1932), pp. 23, figs. 2*).—When varieties of

soybeans and cowpeas, Golden millet, and Sudan grass were compared during five years for their relative value as annual hay plants (E. S. R., 65, p. 824), Sudan grass yielded the most cured hay per acre, and Sudan grass-soybean mixture, millet, soybeans, and cowpeas followed in order. Soybeans have been very dependable, with Wilson-5 and Harbinsoy outstanding varieties. Cowpeas were the hardest to cure, soybeans next, Sudan grass and Sudan-soybean mixture third, and Golden millet the least difficult.

Soybeans and cowpeas were markedly superior to millet and to Sudan grass in contents of protein and minerals. In the production of total digestible nutrients per acre Sudan grass was much better than millet or timothy grown under similar conditions. Soybeans produced more actual feed than cowpeas and equaled adapted strains of red clover. The Sudan grass-soybean mixture yielded over 30 per cent more digestible nutrients per acre than soybeans alone or red clover, and nearly as much as a full season crop of alfalfa. The nutritive ratio of soybean hay equaled or exceeded that of red clover or alfalfa, depending on the soybean variety. As the rate of planting Wilson-5 soybeans increased from 3 or 4 seeds to 6 or 8 per foot in drill rows 7 in. apart, the percentage of protein, ash, nitrogen-free extract, and fat increased and the fiber content decreased.

Soybeans are recommended both as an emergency hay plant and as a regular crop, particularly on soils poorly suited to alfalfa. Mixtures of Sudan grass and Wilson-5 soybeans are advocated in place of soybeans on very weedy land and under conditions where curing may be difficult. In quality such hay resembles that of timothy and clover mixed.

A method for the determination of comparative hardiness in seedling alfalfas by controlled hardening and artificial freezing, G. L. PELTIER and H. M. TYSDAL (*Jour. Agr. Research [U. S.], 44 (1932), No. 5, pp. 429–444, fig. 1*).—The method developed by the Nebraska Experiment Station, cooperating with the U. S. Department of Agriculture, is said to give reliable and consistent results in determining relative hardiness in different alfalfas (E. S. R., 66, p. 731) and to offer a rapid means of testing them for comparative cold resistance. It also may be used for selecting hardier types within a strain or variety.

Seed of alfalfas to be tested are sown in small pots or preferably in cypress flats in alternate rows with a control alfalfa of known hardiness, and allowed to grow under optimum conditions in the greenhouse for one month. They are then transferred to the hardening chamber, held at 2 to 4° C. for two weeks. The soil is brought to a high and uniform moisture content, and the flats with the seedlings are then exposed in the freezer room for a number of hours to a temperature somewhere between −10 and −20°. The length of exposure to low temperatures is so gauged that about 50 per cent of the control variety survives. After freezing, the seedlings are returned to the greenhouse and two weeks later survival counts are made. The actual survival percentages of the alfalfas are calculated in terms of the control alfalfa, and comparisons between alfalfas are made by this standard.

Barley tests at the Sheridan Field Station, R. S. TOWLE and R. M. WILLIAMS (*Wyoming Sta. Bul. 185 (1932), pp. 12, fig. 1*).—Trebi, averaging 40.8 bu. per acre, outyielded other barleys tested on dry land in cooperation with the U. S. Department of Agriculture. Coast and Horn barley yielded 4.6 and 5.6 bu., respectively, less than Trebi over the period that each was grown. Beardless, or naked, or smooth-awned varieties yielded less than the best awned, hulled barleys. Planting tests suggested that barley should be sown within

the first month after field work becomes possible. The heavier seeding rates yielded slightly the highest, although yields differed little from any of the rates from 3 to 8 pecks per acre.

Broomcorn varieties on heavy plains soils, H. H. Finnell (*[Oklahoma] Panhandle Sta., Panhandle Bul. 39 (1932), pp. 10*).—Dwarf varieties of broomcorn, notably Dwarf Acme and Common Dwarf, gave higher average yields of brush than standard or intermediate broomcorn in both narrow (3.5 ft.) and wide (7 ft.) spacing during the years 1924–1931. Standard varieties benefited by wide spacing but did not equal the yields of dwarf in any spacing during the period. The height of dwarf varieties increased about 3.5 in. in wide spacing, but none exceeded 6 ft. in the most favorable season. The effects of growing conditions on broomcorn yields were similar to those on grain sorghums, although broomcorn appeared more sensitive to midsummer drought.

The germination of cottonseed at low temperatures, C. A. Ludwig (*Jour. Agr. Research [U. S.], 44 (1932), No. 4, pp. 367–380, figs. 3*).—Numerous varieties of cottonseed were tested for germination by the South Carolina Experiment Station, using temperatures of 12, 15, and 25–30° C. The minimum temperature for germination was about 12°, with a rapid increase in activity up to 15°. Cottonseed that did not germinate at a given low temperature often remained viable for two months or longer under the unfavorable conditions. Pima cotton and two varieties of *Gossypium nanking* exhibited the most rapid and complete germination at low temperature. A Cleveland strain often ranked very low. Most of the upland varieties were intermediate but could not be ranked among themselves. There were indications that the rate and percentage of germination in the cold increased with the age of the seed. It is suggested that individual variations in the ability of cottonseed to germinate in the cold, if hereditary and correlated with seedling hardiness, could be used in selection for such hardiness.

Cotton investigations, J. C. Overpeck and W. T. Conway (*New Mexico Sta. Bul. 201 (1932), pp. 13*).—The optimum planting date for cotton in the Mesilla Valley appeared to be about the last week in April. Variously spaced plants differed little in acre yield, the usual method, one plant 10 to 12 in. apart, being as good as any other spacing. Topping (removing the terminal buds) the plants to check vegetative growth did not increase yields and often depressed yields. The shrinkage loss of cottonseed piled in the open for a few months amounted to 5.5 per cent and that stored under a dry shelter 1.2 per cent.

Neither nitrogen nor phosphorus fertilizers appeared to return increased yields on heavy, fertile soils, although there were indications that such treatment might give higher yields on light soils and on fields continuously cropped to cotton for several years. Manure increased yields and seemed to delay maturity somewhat.

Kudzu, a forage crop for the Southeast, A. J. Pieters (*U. S. Dept. Agr. Leaflet 91 (1932), pp. 8, figs. 3*).—The habits and soil and cultural needs of kudzu are described, with notes on cutting the legume for hay, on grazing, and on its value for soil improvement, as a cover crop, and in preventing erosion.

Experiences in pasturing Sudan grass, J. S. Cutler and W. E. Weaver (*Ohio Sta. Bimo. Bul. 156 (1932), pp. 98–104, fig. 1*).—Sudan grass was used successfully as a supplementary summer pasture for dairy cows in 1929, 1930, and 1931 at the Hamilton County Experiment Farm. It was indispensable during the drought year of 1930 when bluegrass was killed out in large areas in the permanent pasture. There was no difficulty with forage poisoning in 1930. An advantage of Sudan grass over leguminous pastures is that it does

not cause bloating. The cattle will fill up in less time on Sudan grass and thus spend more time in the shade and away from flies. Indications were that the minimum time between sowing and the date on which it is ready for pasturing is 30 days. By using Sudan grass pasture as a supplement to permanent bluegrass pasture the milk flow could be maintained during midsummer, when a reduction usually occurs. Methods of growing the crop are described briefly.

Planting season for sugar beets in central California, K. Esau (*California Sta. Bul. 526 (1932), pp. 20, figs. 3*).—Early planting of sugar beets, especially in late December, January, and early February, according to results of experiments at Davis and observations in commercial fields in the San Joaquin, Sacramento, San Juan, and Salinas Valleys, is to be recommended for central California. Early plantings have long growing seasons, benefit more from winter rains, make major growth during cool weather, attain considerable size and are relatively resistant at the time of curly top infection, whereas late plantings have shorter growing seasons, smaller size, and often poor stands, and may suffer more from curly top. The characteristics of the crops from very early, early, and late sowings have been noted elsewhere (E. S. R., 65, p. 728).

Sweet potato culture in the Coastal Plain of Georgia, O. Woodard (*Georgia Coastal Plain Sta. Bul. 17 (1932), pp. 52, figs. 8*).—Superseding an earlier publication (E. S. R., 55, p. 532), this presents in addition to general cultural information data on comparative yields of varieties, effects of fertilizer, etc. No real difference was found between yield of northern- and southern-grown seedstocks or between tip and stem end of seed potatoes. Based on fertilizer tests, a formula of 4–8–6 (N–P–K) is recommended. Highly concentrated fertilizers in some cases reduced yields, apparently because of their injurious effect on the stand. As a source of nitrogen a 50–50 mixture of sodium nitrate and cottonseed meal proved most efficient, and kainit proved the best source of potash. Data on the spacing of plants, manner of applying fertilizer, time of planting, pruning, keeping quality in storage, and diseases are also included.

Potash requirements of the tobacco crop, P. J. Anderson, T. R. Swanback, and O. E. Street (*Connecticut State Sta. Bul. 334 (1932), pp. 133–217, figs. 3*).—Investigations at the Tobacco Substation concerned with potash as a fertilizer for cigar leaf tobacco, reported annually (E. S. R., 65, p. 334), are reviewed together with pertinent material from other sources. The functions of potassium in plant nutrition and symptoms of potash deficiency in the green tobacco plant are described briefly.

Tobacco removes annually from the soil about 150 lbs. of potash. The amount of potash in the leaf differs widely, depending on the quantity in the soil, relation of other bases in the soil, and weather conditions. This percentage was observed to vary directly with the potash applied in the fertilizer, and inversely with the proportion of calcium and magnesium; the quantity of potash was generally higher in wet seasons than in dry.

Although the tobacco soils of Connecticut are well supplied with native potash in minerals derived from parent rocks, the very small percentage becoming available each year is so inadequate for the tobacco crop that annual applications of potassic fertilizers are necessary. Certain practices, e. g., gypsum, sodium nitrate, sulfur, manure, and fertilizers that increase soil acidity, and turning under cover crops may accelerate the liberation of the native potash, but none of them alone or in combination could be relied on to furnish enough for crop needs.

Potash in considerable quantities (from 40 to 130 lbs.) is lost from tobacco soils annually in the drainage water, but only a small part of this loss occurs while the tobacco is in the field. In lysimeter tanks containing only the surface 7 in. of soil the loss varied with the soil type, being lowest (from 12 to 38 lbs.) on a soil of high colloid content and higher (72 lbs.) on sandier soils. Ammonium sulfate greatly increased the outgo, while sodium nitrate had the opposite effect. On the sandier soils there was a distinct correlation between water loss and leaching of potash. While no differences due to this treatment were reflected in the potash loss for the first year from 20-in. tanks, during the second year the effects of ammonium sulfate and sodium nitrate became more evident, and the effect of a great excess of potash in potassium nitrate began to be apparent. There were no significant differences in outgo where organic fertilizers were used.

Potassium in the plant exists only in soluble ionizable compounds and never in organic combination with the protoplasm or other essential parts. All of the potash compounds of the tobacco leaf were observed to be water-soluble. While it is not improbable that a small amount of potash may be lost from living leaves during severe rains, the quantity appeared to be too small to cause serious concern. The hygroscopicity of the potash compounds in the leaves was demonstrated to be the factor that makes cured tobacco come into case during damp weather. Consideration of the rate of potash absorption in the field showed that, except in the seedling stage, no consistent trend toward higher or lower percentage in the plant occurred during growth. When the percentage of potash in the plant was high, nitrogen also was high for the same period, indicating a parallel absorption. The maximum potash absorption and the greatest increases in dry weight and total nitrogen occurred during the fifth and seventh weeks of field growth.

Pointing out that the fire-holding capacity of cured leaves depends on the potash salts contained, the authors show that the different salts of potassium are not equally suitable for imparting this quality. In order of excellence, the salts tested ranked as follows: Carbonate, malate, citrate, oxalate, acetate, nitrate, hydrate, sulfate, secondary phosphate, chloride, and primary phosphate. In general the organic salts were most effective, whereas the inorganic salts imparted at most only a small degree of fire-holding capacity.

About 200 lbs. of potash per acre per year should be applied for best results under conditions resembling those at the Tobacco Substation. Reductions in the fertilizer potash affected the quality more than the quantity of the crop. There was a reduction in yield only at the lowest rate (40 lbs. per acre), and this was not apparent the first year. However, the leaves from plants with insufficient potash were quite inferior in quality, being harsh, dry, short, and inelastic. Each decrease in potash was accompanied by a reduction in the fire-holding capacity as measured by the strip test, and in the same degree the ash became whiter.

Comparisons of potash carriers—potassium sulfate, carbonate, and nitrate, potassium-magnesium sulfate, stems, and cotton-hull ashes—revealed very small differences in yield of leaf and percentage of grades, in the quantity of potash absorbed by the plant (except materials containing repressive amounts of magnesium), in the fire-holding capacity of leaves (except lower in cotton-hull ashes), burn of cigars, or in soil reaction when in quantities furnishing 200 lbs. of potash per acre. Each carrier seemed satisfactory for use in a tobacco mixture. It is suggested that the potash be furnished in two or more carriers rather than one.

Tobacco Substation at Windsor, report for 1931, P. J. Anderson, T. R. Swanback, and O. E. Street (*Connecticut State Sta. Bul. 335 (1932), pp. 219–274, figs. 14*).—Experiments with cigar leaf tobacco (E. S. R., 65, p. 334) were continued along the same general lines as heretofore. Results of potash fertilizer experiments are noted above. The season was average as to temperature and rainfall. During June, excessive rains caused serious leaching of the fertilizer, while July was extremely dry and most of the tobacco required irrigation several times. Both extremes of precipitation were unfavorable to the growth of tobacco.

Experiments on improving growth of tobacco on an unproductive sandy knoll (pp. 224–239).—On a sandy unproductive knoll, such as found on most tobacco farms, where the yield always was about one-half to two-thirds as heavy as on other fields of the farm and the grading poor in proportion, none of six practices tested benefited tobacco enough to make it comparable to that on the better fields. Neither stable manure applied every year supplementary to the regular fertilizer ration, nor large quantities of commercial humus resulted in significant improvement. Mixing the surface soil with stiff dark clay and also the use of mulch paper were beneficial although of doubtful economy. The sowing of cover crops immediately after the tobacco was removed gave a definite increase. Fractional application of the nitrogen carriers made the greatest improvement, and indicated that on this soil the leaching away of nitrogen is more harmful than the inability to retain moisture. If such areas are to be kept in tobacco the most promising practices are first to use rye, oats, or vetch cover crops every year, and to apply additional readily-available nitrogen just after each heavy rain. The fractional application should be continued until the crop is at least half grown.

Experiments with nitrogenous fertilizers (pp. 239–253).—These pages report the progress of tests of nitrogen carriers and comparisons of sodium nitrate and calcium nitrate as mineral sources of nitrogen.

Effect of adding gypsum to the soil (pp. 253–256).—The application of gypsum increased the yield and improved the grading of the tobacco, raised the percentage of potassium and calcium in the leaf, increased the sulfur content, and reduced the burning capacity. It seemed that gypsum should be applied with caution to tobacco land.

Frenching, or strap-leaf disease (pp. 256–260).—A severe case of frenching near Unionville is described. "The only recommendation that can be made is that the grower keep the reaction of his soil below 6.00 pH, and if this is impracticable and the disease appears year after year on a field, that he use some other field for tobacco."

Tobacco insects in 1931, D. S. Lacroix (pp. 261-268).—Entomological studies (E. S. R., 65, p. 356), reported upon briefly, included records of the prevalence of various species of insects, life history studies on the potato flea beetle, and tests of insecticides.

Curing experiments in 1931 (pp. 268–274).—Experiments in curing shade tobacco under controlled conditions were concerned with the effect of alternate periods of high and low relative humidity, with constant temperature.

The best tobacco from the first and second pickings was produced at constant low humidity; alternations of humidity produced almost as good grade indexes; and constant high humidity caused trouble both from pole sweat and darker colors. Subjecting the tobacco to alternate periods of high and low humidity resulted in a much more uniform color distribution on the cured leaf, but not a great difference on the sweated leaf. Observations during three

years indicated that pole sweat is apt to develop any time after the tobacco is in the yellow stage, providing the air is near saturation.

As the humidity was increased without change in temperature, the tobacco cured more slowly and the colors produced were considerably darker. Conversely the effect of increasing the temperature with the relative humidity constant was to hasten the rate of curing and produce lighter colors. The best colors were produced for first and second pickings at 90° F. and humidities of from 70 to 80 per cent, and the next best at 95° and a humidity of from 80 to 85 per cent. Later pickings always produced darker tobacco, and the results obtained did not permit as definite conclusions. It seemed that a temperature of 85 to 90° combined with a humidity of about 80 per cent was the most favorable condition.

The influence of bees upon clover and alfalfa seed production, C. R. MEGEE and R. H. KELTY (*Michigan Sta. Quart. Bul. 14 (1932), No. 4, pp. 271–277, figs. 5*).—In studies made in both the Upper and Lower Peninsulas of Michigan, honeybees were found to be very effective in pollinizing red clover, alsike clover, and alfalfa, and their presence in large numbers resulted in marked increases in the seed crops of these legumes. Bumblebees also are effective pollinating agents, but their relative scarcity in the clover and alfalfa seed-producing districts of northern Michigan makes them undependable for the purpose of pollination. Such small insects as bugs (Hemiptera) and flies (Diptera), present in large numbers in clover and alfalfa fields, did not seem to serve as pollinating agents and contributed little to the setting of pods and seeds.

Idaho pure seed law, R. S. BRISTOL ET AL. (*Idaho Sta. Circ. 65 (1931), pp. 8*).—The text of the seed law of Idaho, as amended in 1931, is given with instructions for taking samples of seed.

[Weeds of the Union of Socialistic Soviet Republics] (*Trudy Prikl. Bot., Genet. i Selek. (Bul. Appl. Bot., Genet. and Plant-Breeding), 25 (1931), No. 4, pp. 9–288, figs. 87*).—These pages include articles on weeds in different regions of the Union of Socialistic Soviet Republics, mostly with English abstracts. The translated titles are as follows: Some Special Weeds of Transcaucasia, by B. V. Serdiukov (Serdyukov) (pp. 9–41); Weed Seeds in the Commercial Seeds of the Northern Caucasus, by V. V. Kalitaev (Kalitayev) (pp. 43–67); Morphological-Anatomical Distinguishing Characters of the Weed Seed Pertaining to Liliaceae and Iridaceae, by K. V. Kamenskii (K. W. Kamensky) (pp. 69–108); The Weeds of Rice in the Southern Part of the Maritime Region of the Far East, by A. V. Vazinger-Alektorova (Vasinger-Alektorova) (pp. 109–152); The Weeds of Azerbaijan, by F. I. Mal'kov (Malkov) (pp. 153–181); Carpological Peculiarities of *Coronilla varia* and *C. scorpioides*, by I. T. Vasil'chenko (Vassilchenko) (pp. 183–194); Key to the Determination of the Fruits and Seeds of Weed and Cultivated Species of Cruciferae Occurring in the European Part of the Union of Socialistic Soviet Republics, by A. A. Aliavdina (Alyavdina) (pp. 195–213); Weeds in Cereals Grown in the Lena Valley, Their Origin and Distribution, by G. A. Balabaev (Balabayev) (pp. 215–248); The Utilization of *Nicandra physalodes*, by D. K. Larionov (pp. 249–256); The Weeds of the Vyatka Region, by L. B. Kolokol'nikov (Kolokolnikov) (pp. 257–280); *Agrostemma linicola* n. sp., by A. F. Terekhov (Terechow) (pp. 281–283); and *Cuscuta epilinum* in the Ural Region, by A. A. Khrebtov (pp. 285–288).

HORTICULTURE

[**Horticultural investigations in Hawaii**] (*Hawaii Sta. Rpt. 1931, pp. 6, 7, 9, 10, 17–27, 32, 33, figs. 6*).—In this report there is discussed breeding work with lettuce and varietal and cultural studies with beans and coffee, by J. M. Westgate, J. S. Low, and M. Takahashi; with Macadamia nuts, by J. C. Ripperton, D. W. Edwards, and W. T. Pope; observations on native raspberries and other Rubi, and miscellaneous plants, by Pope; and propagation work with the mamey apple, breadfruit, Panama berry tree, ceriman, and other fruits, by Pope and H. F. Willey.

[**Horticulture at the Iowa Station**] (*Iowa Sta. Rpt. 1931, pp. 87, 93–95, 96–106, figs. 3*).—Progress reports are presented giving data by E. W. Lindstrom on the inheritance of fruit size and shape in tomatoes; on studies by E. C. Volz on the storage of gladiolus corms, on varieties of gladiolus, and on the breeding of roses, chrysanthemums, amaryllis, and carnations; on studies by T. J. Maney and B. S. Pickett of methods of propagating apples on their own roots, on growing uniform stocks for propagating apples, on the development of desirable new stocks for apples, and on soil management of apple orchards; on studies by Maney of the relation between bound water and hardiness in apple wood, of various waxes used in grafting, and of the method of grafting designed to prevent callus formation; of studies by H. H. Plagge on losses of apples in cold storage, of processes concerned in fruit ripening in storage, of responses of different apples to storage temperatures, and of the effects of continued application of nitrates on the composition of apples and their keeping qualities; of apple breeding studies, by Pickett, H. L. Lantz, and Maney; of pear and plum breeding studies and of orchard variety studies, by Pickett and Lantz; of peach and black raspberry breeding studies, by Pickett and Maney; upon the propagation of difficult nursery and greenhouse plants, by Pickett, V. T. Stoutmyer, and Maney; upon natural and cool air storages, by Pickett and H. Giese; on sweet corn breeding, by E. S. Haber and Lindstrom; on potato breeding and a systematic study of the Capsicums, by A. T. Erwin; on asparagus culture and on cucurbit breeding, by Erwin and Haber; on pectin changes in stored tomatoes, by Haber; and of the association of vitamins with nutritional conditions in plants, by Haber, P. M. Nelson, and P. Swanson.

[**Horticultural investigations at the Massachusetts Station**] (*Massachusetts Sta. Bul. 280 (1932), pp. 197, 206, 207, 209–211, 224, 225, 235–238, 243–245*).—In this report there are presented the results of studies upon the fertilizer and cultural needs of the onion and upon onion breeding, by M. E. Snell and A. B. Beaumont; the effect of light on the forcing of gladiolus and of moisture, air, and soil pH relations in different types of plant containers, by L. H. Jones; the influence of light quality on plant growth, by A. V. Osmun; photosynthetic studies with the cranberry, by H. J. Franklin, in cooperation with the U. S. D. A. Bureau of Plant Industry; pumping tests, by Franklin and C. I. Gunness; variety tests of cranberries and blueberries, by Franklin; the effect of nutrients on the growth of carnations and roses under glass and on the results of breeding snapdragons, by H. E. White; the interrelation of stock and scion in apples, by J. K. Shaw and J. S. Bailey; the genetic composition of peaches, by Bailey and A. P. French; the results of pruning studies with apples, by Shaw and W. L. Cutler; the effects of various cultural and fertilizer treatments in orchards, by Shaw; fruit variety studies, by Shaw and O. C. Roberts; work on fruit bud formation in the strawberry, by R. A. Van Meter; grape pruning, by R. D. Drain; blueberry propagation, by Bailey;

studies on the use of electricity as a source of heat in the hotbed and propagating bench and tests of vegetable varieties, by P. W. Dempsey; and fertilizer and cultural trials with asparagus and seed improvement studies with squash, beans, and peppers, by R. E. Young.

[Horticulture at the Missouri Station] (*Missouri Sta. Bul. 310 (1932), pp. 41, 42, 43, 44, 45, 47*).—Notes are given as to results of various investigations, including studies of methods of propagating nuts, by T. J. Talbert and A. E. Murneek; a comparison of different sulfur sprays in relation to spray injury, and differences in spray requirements related to variety of apple, by H. G. Swartwout; hardiness in apple trees, by C. G. Vinson and T. B. Gallman; the effect of oil sprays on the hardiness of red raspberry canes and the use of fertilizer on grapes, by Swartwout; the control of biennial bearing of apples, by Murneek; the relation of potash to nitrogen in apple trees, by Murneek and E. J. Gildehaus; sterility in the apple, by Murneek; and selection studies with tomatoes and cabbage for disease resistance and fertilizer tests with the tomato, both by Talbert and W. L. Tayloe.

Experiments with ultra-violet ray glass, II, M. A. H. TINCKER (*Jour. Roy. Hort. Soc., 57 (1932), No. 1, pp. 51–57*).—Further studies (E. S. R., 63, p. 237) at the Wisley Laboratory, England, showed no striking differences in yield of radish, lettuce, or cucumbers whether grown under ordinary glass or under a trade glass of the same thickness but which was supposed to pass the ultraviolet rays. With the radish there was a slight tendency for the root-shoot ratio to be slightly higher under the trade glass, and in lettuce the plants under the trade glass were a little slower in shooting to seed.

The injurious effects of ultra-violet and infra-red radiations on plants, H. J. FULLER (*Ann. Missouri Bot. Gard., 19 (1932), No. 1, pp. 79–86, pl. 1*).—Observations at Washington University on Bonny Best tomatoes and red kidney beans exposed 3 minutes daily for 9 days to a mercury vapor arc lamp with and without the protection of an intervening quartz cell, containing distilled water and which removed a greater part of the infra-red rays, showed a much more rapid and greater injury in the unprotected plants. Injury to the fully exposed tomatoes appeared within 24 hours after the first irradiation and after about 4 days in the water-protected plants. In both the tomato and the bean, the fully exposed plants approached death at the end of 9 days. Since screening out much of the infra-red decreased injury, the author concludes that infra-red rays are concerned in injury when the plants are placed as in the experiment within 15 in. of the lamps.

Sulfur dioxide injury to plants, P. W. ZIMMERMAN and W. CROCKER (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 51, 52, pl. 1*).—Presenting data obtained at the Boyce Thompson Institute on the relative susceptibility of various plants to sulfur dioxide gas, the authors state that this gas is definitely toxic to plant tissues at all times whereas illuminating gas, the effective ingredient of which is ethylene, may be beneficial up to the point where injury begins. Sulfur dioxide entered the leaf through the open stomata or hydathodes in the epidermis. Slightly wilted plants were much more resistant to sulfur dioxide than were turgid plants, but offered no increased resistance to illuminating gas.

The response of plants to illuminating gas, P. W. ZIMMERMAN, W. CROCKER, and A. E. HITCHCOCK (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 53–56, pls. 2*).—Utilizing a range of concentrates from as low as 1 part of gas to 100,000 parts of air and as high as 1 part of gas to 25 of air, observations were made at the Boyce Thompson Institute upon the effects on various plants. Drooping or epinasty of leaves was quickly noticeable in tomato, potato, Ageratum, buckwheat, sunflower, castor bean, Fuchsia, and Nicandra when exposed to gas at

growing temperatures. Tomatoes treated with 1 to 10,000 concentration showed a downward movement of leaves within 3 hours. Cyclamen had resistant leaves, buds, and flowers. Fern and orchid leaves withstood 1 part of gas to 25 of air, but orchid flowers were injured by 48 hours' exposure to a 1 to 800 concentration. *Lilium harrisii* leaves endured 1 to 1,000, whereas the bud was killed by a 1 to 20,000 concentration. These and other variations are cited to show that it is impossible to generalize in regard to gas injury and that each species must be studied separately.

Effect of ultraviolet radiation on growth and respiration of pea seeds, with notes on statistics, M. P. Masure (*Bot. Gaz., 93 (1932), No. 1, pp. 21–41, fig. 1*).—At the Hull Laboratory, University of Chicago, the irradiation of air-dry seeds of *Pisum sativum* to ultra-violet light of 3,650 a. u. wave length exerted a stimulative action on the subsequent rate of growth of the hypocotyl. The rate of respiration of etiolated pea seedlings was temporarily increased by similar light treatment.

The analysis of tomato plants, Part II, O. Owen (*Jour. Agr. Sci. [England], 21 (1931), No. 3, pp. 442–451, figs. 4*).—This is a further report (E. S. R., 62, p. 432) upon studies at the Cheshunt Experimental and Research Station, England, as to the effect of modifications in fertilizer treatment on the composition of tomato foliage. The omission of phosphorus or of nitrogen had no consistent effect on the ash content of the foliage, but the omission of potash did depress ash content in each of the 4 years. The nitrogen content of the foliage varied during the season irrespective of manurial treatment. The omission of phosphorus depressed the nitrogen content in 3 of 4 years. The omission of nitrogen decreased the nitrogen content and affected the appearance of the plants detrimentally. The omission of potash had little influence on nitrogen content, but apparently increased the phosphorus content. If potash was supplied to plants deficient in potash, the phosphorus content then declined. However, when phosphorus was omitted the potassium content of the foliage was decreased, rising again if phosphorus was supplied.

The Break o' Day tomato, F. J. Pritchard and W. S. Porte (*U. S. Dept. Agr. Circ. 218 (1932), pp. 4, pl. 1, fig. 1*).—This new tomato, resulting from a 1923 cross between Marglobe and Marvana, is illustrated in color and discussed as to origin, characteristics, adaptability, etc.

Watermelon culture in the Coastal Plain of Georgia, O. Woodard (*Georgia Coastal Plain Sta. Bul. 18 (1932), pp. 40, figs. 2*).—This is a general discussion upon watermelon culture and crop handling, supported by the results of various variety, cultural, and fertilizer tests. A fertilizer formula 4–8–6 to 8 (N–P–K) was found satisfactory, and synthetic nitrogen materials proved good sources of nitrogen and kainit of potash. Plants spaced 10 by 10 ft. were the most productive on the acre basis.

Fruit fertility investigations at Weihenstephan [trans. title], F. Wagner (*Arb. Deut. Landw. Gesell., No. 377 (1931), pp. 111, pls. 4, figs. 5*).—This study covers long-continued investigations with pears and berries.

I. *Experiments with pears, 1903–1926.*—During the first 10 years following planting all trees prospered irrespective of fertilizer treatment, but after this period a lack of nitrogen was manifested. In fact, the leaf, wood, and fruit growth throughout the 24 years was closely correlated with the nitrogen supply. Toward the end of the period a lack of phosphorus and potash was noticeable in the leaves and current season shoots. Leaves and fruits of plants from trees from which potash or phosphorus was withheld were noticeably richer in proteins.

About one-half the total trunk girth gained was made in the first 8 years, and production ran parallel with trunk-girth increase. Increasing nitrogen applications increased the nitrogen content of the fruits, and higher nitrogen in the fruit accelerated ripening in storage and increased the weight loss of pears during storage. As the experiment progressed the omission of potash caused a gradual lowering of quality.

Analyses of the leaves and current-season shoots were useful in the later years of the experiment in showing a lack of nitrogen and potash in the soil and, to a lesser degree, phosphorus. When calcium was high potash was low in the leaves and vice versa.

Trees dug at the close of the experiment corresponded closely in total weight with the weight of fruit produced. The ratio of roots to tops averaged 1:4.62. With respect to nitrogen, root wood was lowest, trunk and branches intermediate, and fruiting spurs highest. Phosphorus and lime were higher in the trunk and limbs than in the roots. Potash was higher in the trunk and branches than in the fruiting shoots. The total weight of leaf, fruit, and wood paralleled ash, nitrogen, phosphorus, potash, calcium, and magnesia. In the complete-manured trees the phosphorus and magnesium content rated as 1, that of potash and nitrogen as 3, and calcium as 7. Some indication was obtained that the onset of pear scab was somewhat delayed by proper fertilizing.

II. *Experiments with berries, 1907–1926.*—Utilizing as plant material currants, gooseberries, raspberries, and strawberries growing in open concrete tanks, the author found that reactions of these species to differential fertilizer treatments were much more rapid than in the case of the pears. In the Red Dutch currant and the Wynham Industry gooseberry the weight of roots produced the first two years after planting was greater than that of the tops, but thereafter the situation was reversed. In the Bang Up black currant the top growth was greater throughout. In general the nonmanured plants produced the lowest yields and the complete-manured the highest. Limitation in nitrogen and potash decidedly depressed the yield of Red Dutch currants, and a lack of phosphorus was harmful to a lesser extent.

In the red currant complete manuring gave the highest and no manuring the lowest content of sugar in the berries. A lack of phosphorus, potash, or nitrogen diminished the average sugar content, but no striking influence of potash on sugar content was seen. Analyses of red currant leaves at time of harvest were useful in indicating a lack of potash in the soil, but not of nitrogen or phosphorus. On the heavy soil used, black currants showed a high nitrogen need, less for potash, and almost none for phosphorus. In the red and black currant and also in the gooseberry, production of roots and tops closely paralleled fruit. The root-top ratios were 1:2.7, 1:4, and 1:1.4 in the red currant, black currant, and red gooseberry, respectively.

The red raspberry Marlborough responded markedly to nitrogen, little to potash, and still less to phosphorus. A lack of potash had the least effect on total sugar content and total acid of raspberries. The strawberry Hansa responded especially to nitrogen fertilizers, but the largest yield was obtained from complete fertilizers.

The problem of unfruitfulness in the cultivated apple, S. R. Hall (*Amer. Nat., 65 (1931), No. 701, pp. 512–530, fig. 1*).—In self-pollination studies conducted over a 2-year period by the University of Virginia, Grimes Golden, York Imperial, Delicious, Stayman Winesap, Winesap, Baldwin, and Ben Davis set 4.5, 2.9, 1.2, 0, 0, 0.5, and 0 per cent, respectively. With respect to the value of the different varieties as pollen parents, York Imperial and Delicious

were highly efficient, giving over 17 per cent set when used on four other varieties. Grimes Golden set no better when cross-pollinated than when selfed, a situation believed accountable by the fact that when Grimes Golden styles were longer than the stamens they bent down into contact with the stamens.

Testing apple pollen on a 5 per cent sugar medium, the author observed that less than 30 per cent of the grains of Stayman Winesap, Baldwin, and Ben Davis germinated, whereas York Imperial and Grimes Golden obtained 70 per cent and Delicious 90 per cent. The underlying causes of self-unfruitfulness in the apple are discussed.

Pollination of the McIntosh apple in the Champlain Valley.—Third progress report, A. B. Burrell and R. G. Parker (*Amer. Soc. Hort. Sci. Proc.*, 28 (*1931*), *pp. 78–84*).—In further studies (E. S. R., 66, p. 637) in the Champlain Valley, conducted by the New York Cornell Experiment Station, hand-pollination of McIntosh flowers with Fameuse, Tolman, Delicious, and Cortland gave satisfactory results in all cases. Counts showed an average of 6, 8, 7.5, and 5.3 seeds per apple in the four crosses, respectively. Early McIntosh, Milton, Kendall, Lobo, and Macoun pollens gave promising results on McIntosh. In a solid McIntosh orchard hand-pollination for three successive seasons of the same branches resulted in doubling the yield. The value of placing bouquets of compatible blooms near McIntosh flowers during a cold rainy season was shown in a greatly increased percentage set in adjacent branches as compared with those on the opposite side of the tree or on adjacent trees.

A device to facilitate pollen distribution by bees, A. B. Burrell and G. E. King (*Amer. Soc. Hort. Sci. Proc.*, 28 (*1931*), *pp. 85, 86, fig. 1*).—A device developed by the New York Cornell Experiment Station in pollination studies in the Champlain Valley, in which bees leaving the hive are forced to walk through compatible pollen, is briefly described. Preliminary observations upon screened McIntosh trees indicate that the apparatus has value in weather conducive to bee flights.

Growth characteristics of a number of selected apple stocks, T. J. Maney (*Amer. Soc. Hort. Sci. Proc.*, 27 (*1930*), *pp. 94–101*).—Tabulated data are presented on the growth characteristics of a large number of apple stocks growing at the Iowa Experiment Station. Certain varieties were of outstanding merit as producers of seedlings for rootstocks, and others such as Virginia Crab and Hibernal were almost worthless. A comparison of Brier Sweet × Mercer seedlings, French crab, and two commercial lots as stocks for Jonathan, Delicious, Grimes Golden, Secor, and Sharon buds showed very favorably for the home-grown stocks. Evidences were seen that the seedling strain had more influence on the resulting grades of nursery trees than did the manner of grafting. Observations upon nursery trees, in which a known variety was budded on several different rootstocks, showed in practically every case that the budded variety induced a characteristic type of root development. Where trees were double-worked the intermediate section appeared to dominate the situation as regards root development.

The relation of distance and direction of the fruit from the leaves to the size and composition of apples, M. H. Haller (*Amer. Soc. Hort. Sci. Proc.*, 27 (*1930*), *pp. 63–68*).—Measurements at Arlington Experiment Farm, Va., of apples on ringed branches on which were left 20 leaves and 1 fruit, but with the leaves located at different positions with reference to the fruit showed no significant difference in volume increase whether the leaves were above, below, or on separate branches. Records taken on apples left on unringed branches from which all the leaves were removed showed strong posi-

tive correlations, except for Grimes Golden, between the increase in volume and the volume at the start, indicating that the relative rate of growth of the fruit had not been changed by defoliation.

It was evident that apples can draw on elaborated foods synthesized at a considerable distance from the fruit, since practically no decrease in size and sugar content of fruits was recorded in Grimes Golden, Ben Davis, York Imperial, Jonathan, and Baldwin when the leaves were not closer than 4.5, 6, 6, 6.5, and 10 ft., respectively.

Light intensity as a factor in the development of apple color and size, A. L. SCHRADER and P. C. MARTH (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 552-555, pl. 1*).—In this study at the University of Maryland, apples on the outer portions of the trees were enclosed when still showing little or no color in double cheesecloth and single and double muslin sacks which, on the basis of unscreened light as 100, transmitted 80.8, 61.4, and 39.2 per cent. In the two seasons in which the work was continued marked reducing effects of the sacks were noted on the development of red color, and some reduction in fruit size was also observed.

Muslin capable of reducing the transmission of ultra-violet light about 10 per cent practically inhibited color development. Varieties differed in their response to shading, the early kinds being on the whole more adversely affected than were late varieties. It is deemed possible that size reduction resulted from decreased photosynthetic activity in the skin of the apples themselves, since the subtending leaves were not shaded.

Relation of catalase activity to temperature, respiration and nitrogen fertilization of Grimes Golden apples, P. L. HARDING (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 37-42, figs. 3*).—During the storage season of 1929-30 catalase and respiration determinations were made periodically at the Iowa Experiment Station upon Grimes Golden apples harvested from vigorous-growing fertilized trees and from trees showing a nitrogen deficiency. In both immediate and deferred storage at 30 and 36° F. and in continuous storage at 50°, fruit from the nitrated trees was consistently higher in catalase activity. Catalase activity appeared to be independent of respiratory intensity at temperatures of 30 and 36°, but at 50° there was observed a distinct correlation. Catalase activity was more constant throughout the storage season when apples were placed immediately in storage at 30 or 36° than if held for 3 weeks at 50° prior to low temperature storage. Catalase activity was higher with delayed storage apples than with those stored promptly, and higher and more irregular at 30° than at 36° in both the nitrogen and control lots. In the case of deferred storage high catalase activity was recorded just prior to the onset of soggy breakdown and at the same time no corresponding increase was observed in respiratory activity, leading to the conclusion that respiration is the less sensitive indicator of this storage disorder.

Time of applying nitrogen to apple trees, F. W. HOFMANN (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 19-22*).—Terminal growth measurements made over a 4-year period by the Virginia Experiment Station on Stayman Winesap apple trees fertilized with ammonium sulfate in March, April, May, June, July, and August, respectively, showed in favor of March and April applications. A fall application of 4 lbs. of sodium nitrate to York Imperial trees was somewhat less effective than comparable spring treatments in promoting terminal growth. Yields, however, were slightly in the opposite direction. In the case of York Imperials split applications, half in March and half in June, were more effective in increasing yield than was a single application in March. The author

discusses the possible correlation between the effectiveness of any given date of application and the tendency toward precipitation at that time.

Do successive applications of nitrogenous fertilizers influence the development of physiological disorders of apples in cold storage? H. H. Plagge (*Amer. Soc. Hort. Sci. Proc.*, *27* (*1930*), *pp. 23–27*).—Believing that the abrupt increases in the percentage of breakdown developing in Jonathan apples held at 30° F. were associated with heavy applications of nitrate of soda, observations were made in 1929 at the Iowa Experiment Station upon Jonathan and Grimes Golden apples from trees which had never received nitrogen and from trees which had been variously fertilized. The storage lots consisted of two boxes per treatment of carefully graded fruit, all harvested the same day. With Jonathan apples held at 30° striking differences were recorded on February 1 in the percentage of soggy breakdown, reaching a maximum of 77.5 per cent in fruit stored without delay from trees receiving 5 lbs. of nitrate of soda in each of the two preceding years. Deferring storage for 10 days greatly reduced injury, and deferring storage for 20 days practically eliminated injury. No soggy breakdown occurred in any of the lots held at 36°. Similar results were secured with Grimes Golden apples, except that postponing storage increased susceptibility to breakdown in amounts more or less proportional to the delay.

Nitrogen fertilization and the keeping quality of apples, H. E. Knowlton and M. B. Hoffman (*Amer. Soc. Hort. Sci. Proc.*, *27* (*1930*), *pp. 28–31*).—In this preliminary report from the West Virginia Experiment Station, information is presented on the storage behavior of Stayman Winesap and Black Twig apples harvested from 20-year-old trees growing in a cultivated orchard located on a limestone soil of good fertility, but receiving differential nitrogen fertilizer treatments. As determined by the pressure tests, fruit from nonfertilized trees was firmer than that of nitrated trees. Fruit from trees receiving 10 lbs. of nitrate was generally softer than that from trees receiving 5 lbs. In a similar experiment with Grimes Golden apples variability between individual trees was so great and shriveling in storage so abundant as to confuse results, but there was an apparent tendency for nitrated trees to produce the firmer fruits.

The studies brought out the fact that it is impossible to set an arbitrary standard for pressure testing at picking time. In the very dry season of 1930, fruit tested almost 4 lbs. higher than in 1928, due apparently to the different types of cellular structure produced under different moisture conditions.

Cool storage investigations, G. B. Tindale (*Jour. Dept. Agr. Victoria*, *30* (*1932*), *No. 2*, *pp. 95–104*).—Using Cleopatra, well known for its susceptibility to bitter pit, and Jonathan, highly susceptible to internal breakdown, as well as certain other varieties picked in different stages of ripening in the different orchards, the author found in these studies carried on in the Government Cool Stores, Melbourne, Australia, that the occurrence of diseases in storage was more closely associated with the particular trees from which the fruit was harvested than with the stage of maturity at time of picking. The author believes that the tree's water supply exerts a profound influence on the susceptibility of the fruit to the physiological diseases studied. In an irrigation experiment apple trees receiving no water bore a considerably higher percentage of pitted fruits than did those watered late in the season.

A study of the skin structure of the Grimes apple as affected by different types of injury, C. E. Baker (*Amer. Soc. Hort. Sci. Proc.*, *27* (*1930*), *pp. 75–81*, *pls. 4*).—The results are presented of a study at the Indiana Experiment Station of the anatomical structure of healthy, russeted, frost-injured, storage-

scalded, sulfur-burned, and ammonia-injured Grimes Golden apple skins. An examination of well-matured, smooth-skinned, and moderately-russeted Grimes Golden apples held in storage from October 3 to April 3 showed the smooth apples to have lost 9.5 per cent of their original weight as compared with 15.2 for the russeted apples, indicating that russeting is a less efficient covering than the normal epidermis and cuticle.

The influence of ethylene gas treatment upon the coloring and ripening of apples and pears, F. W. ALLEN (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 43–50*).—Treatment at the California Experiment Station of Gravenstein apples with ethylene gas had no effect on the red color, but did in several cases change the green ground color to greenish yellow. As recorded by the pressure tester early-picked apples ripened slightly sooner when ethylene treated, but late-picked apples were not affected. Some indication was obtained that bitter pit may be reduced but not prevented by ethylene. Chemical analysis showed a slight increase in reducing sugar and a similar decrease in acid content of apples held at 50° and treated with ethylene. Preliminary observations showed a reduction in starch.

In studies with pears, ethylene apparently hastened to a slight extent the ripening of most varieties tested and in certain instances enhanced color. Chemical analyses of Bosc pears showed no differences in sugar or acid contents of treated or untreated fruits.

Recent discoveries in pollination methods and practices and their influence upon greater yields of desirable fruit, H. D. HOOTMAN (*Md. Agr. Soc., Farm Bur. Fed., Rpt., 15 (1930), pp. 170–182; also in Md. State Hort. Soc. Proc., 33 (1931), pp. 24–30*).—A general discussion, supported by various experimental results, is presented in which is brought out the important rôle of insects in fruit pollination. For example, screened Montmorency cherry blooms set only 4 per cent of fruit as compared with 49 per cent for flowers hand-pollinated. At the Graham Horticultural Substation near Grand Rapids, Mich., Bartlett and Seckel pears were found to be intersterile, with Bosc, Howell, and Flemish Beauty satisfactory pollinizers for both varieties.

Pruning the peach, R. E. MARSHALL (*Michigan Sta. Quart. Bul., 14 (1932), No. 4, pp. 284–290, figs. 4*).—Of seven different methods of pruning compared with Gold Drop peaches at the Graham Horticultural Substation, the nonpruned trees yielded the most fruit but produced by far the lowest percentage of peaches above 2-in. size. The largest average net return per tree was secured in the moderate dormant and light dormant thinned groups. Measured in total number of pounds of wood removed in pruning, these were among the least severely pruned groups. Based on the results, there are presented practical recommendations for pruning peach trees.

Does potassium increase the sugar content of prunes? O. LILLELAND (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 15–18*).—Determinations at the California Experiment Station of the sugar content of prunes taken from trees suffering from a lack of potash and from adjacent trees adequately supplied with potash showed no effect of potash on sugar content. In one case where muriate of potash was supplied at the rate of 50 lbs. per tree the sugar content of the fruit was not affected, although the potash content of the leaves and fruit was increased.

Experiments with a new type of pressure tester on certain stone fruits, L. VERNER (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 57–62, pl. 1, figs. 2*).—Briefly describing a new type of pressure tester developed by the Idaho Experiment Station and sufficiently delicate to record a difference of 51.1 per cent in Napoleon cherries from the first show of color to full maturity, the author

presents maturity data taken with the tester on cherries and on the Italian prune.

In the case of cherries changes in pressure resistance varied inversely with changes in volume as measured by water displacements and Balling scale hydrometer readings. In other words, as the volume and sugar content increased, resistance to pressure decreased. A tendency was noted in the Bing, Lambert, and Napoleon cherries for the pressure curve to flatten in the latter part of the season, apparently just prior to the proper stage of beginning harvest. However, this flattening is not deemed of major importance since delayed picking is said not to affect materially the shipping quality of sweet cherries. Maturity differences up to a week in length were observed between single trees of one variety associated with the size of the crop.

Comparisons between the Idaho and U. S. testers for determining the maturity of the Italian prune showed no significant differences. Prunes tested repeatedly with the Idaho tester kept quite as well in cold storage as did a control lot not so treated.

Transpiration studies on strawberries, G. M. Darrow and H. Sherwood (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 225–230*).—Observations by the U. S. Department of Agriculture in cooperation with the Oregon Experiment Station on the water losses of plants growing in paraffined pots, the soil of which was also covered to prevent evaporation, showed little difference per unit area of leaf whether the leaves were old on not. Where part of the leaves were removed it was found that those remaining transpired more per unit area than did leaves on plants with more leaf surface. Considerable variation was noted between varieties and species in their transpiration activity. Marshall had the lowest average rate of transpiration and a strain of *Fragaria chiloensis* the highest. Plants lost 85 per cent of their water in the day and 15 per cent during the night. Where leaves of wilted plants were plunged in water they absorbed sufficient moisture to regain turgor.

The relation of fertilizers to respiration and certain physical properties of strawberries, E. L. Overholser and L. L. Claypool (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 220–224*).—As noted by the Washington Experiment Station, the average respiration intensity of strawberries from nitrogen-fertilized plats was nearly 10 per cent more than that of berries from comparable nonfertilized plats. Adding extra nitrogen brought the difference to nearly 20 per cent. The application of phosphorus either alone or combined with nitrogen seemed to depress respiration intensity. The respiration ratio was higher the higher the respiration intensity, but the values averaged below unity.

As indicated by pressure tests, the firmness of berries was decreased by applications of nitrogen and phosphorus either singly or in combination. Measured in terms of electrical resistance, berries from the extra nitrogen plats having the highest respiration intensity had the lowest specific resistance. The fruit from the phosphorus plats averaging lowest in respiration averaged highest in specific resistance.

Effect of fertilizers on firmness and flavor of strawberries in North Carolina, G. M. Darrow (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 231–235*).—Although pressure readings taken in 1928 on strawberries harvested on four different dates from fertilized plats at Willard, N. C., showed with one exception somewhat greater firmness in fertilized berries, the differences were not significant. A similar test in 1931 again showed relatively little difference between plats. In general, however, where leaf growth was greatest, the berries were softest. Where berries were graded to size, the smaller ones were consistently firmer.

Some indication was noted that fertilizers affected the flavor of Missionary strawberries, potash apparently inducing sourness and lack of flavor and superphosphate favoring sweetness and good flavor. Somewhat comparable observations were made on Blakemore strawberries in 1930, the preserved fruit from the potash or potash-plus-nitrogen plats being markedly inferior. However, in 1931 no consistent differences were seen.

Length of the fruit development period of strawberry varieties, J. H. CLARK (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 211-215*).—Observations at the New Jersey Experiment Stations upon the length of time elapsing between first bloom and first ripe fruit in the Howard 17 strawberry showed an association between early blooming and a relatively long fruit development period, but the differences were not large. Similar observations on other varieties showed the same trend, but it was evident that unusually high temperatures during ripening may shorten the period so that ripe fruits are obtained in the same time that is required with late blooming. Varieties with a short fruit development period were not necessarily early ripening, but early maturity was usually correlated with early blooming and late ripening with late blooming.

Fruit bud differentiation in the Dunlap strawberry in relation to the age and position of the plant, J. C. SCHILLETTER (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 216-219, pl. 1*).—Observations at the Iowa State College on the number of days elapsing between the time that runner plants rooted and when they differentiated flower buds showed that season is a much more potent factor than elapsed time. Plants 138, 77, and 63 days from rooting all formed buds about the same time. In late runner plants fruit buds appeared in 10 days. With plants differently located in regard to the mother but rooting at the same time, there was some tendency for those near the mother to differentiate flower stalks earlier. Since early runners made the strongest plants and differentiated fruit buds earlier, the author recommends saving them at the expense of those formed late in the season.

Strawberry culture in Louisiana, B. SZYMONIAK (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 173-175*).—Of three methods of propagation tested at the Fruit and Truck Experiment Station, La., that in which fruiting beds were established in October or November with the first and second runner plants from young plants formed in the old fruiting bed in May or June and reset in July gave the best results in terms of yield. As regards fertilizer the best results were obtained from a 4-12-4 mixture applied at the rate of 1,500 lbs. per acre and made up of nitrate of soda, superphosphate, and muriate of potash.

Seed and berry size of cane fruits, G. M. DARROW and H. SHERWOOD (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 194-199, pl. 1*).—Data presented by the U. S. Department of Agriculture upon the weight of berries and seeds, number of drupelets, and percentage of seed to flesh in 16 varieties and species of brambles as well as in 24 selfed seedlings of Logan showed much variability. The Young dewberry had the largest seed, 3.82 mg, and *Rubus leucodermis* the smallest, 1.06. Cuthbert raspberry seeds averaged 1.43 mg. In general, hybrid blackberries and dewberries had larger seed than either parent. On the other hand, of the 24 Logan seedlings 16 had smaller and 8 larger seeds than Logan, the average weight being almost exactly that of the parent.

R. leucodermis with the smallest seeds had the largest number of drupelets per berry. The largest percentage of seed in relation to flesh, 8.92 per cent, was found in Farmer. It is pointed out that at least two characters other than size and seed percentage affect seediness, namely, the hardness of the seed and the manner of attachment to the fibers.

The Glenndale gooseberry, G. M. DARROW and G. F. WALDO (*U. S. Dept. Agr. Circ. 225 (1932), pp. 4, figs. 2*).—A description is presented of a new gooseberry which is being introduced because of its adaptability to the southern limits of gooseberry culture.

Use of the survey method in showing cultural factors in red raspberry production, J. T. BREGGER (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 200–205*).—Records obtained by the Washington Experiment Station from 69 raspberry growers in Pierce County are analyzed, and show that on poor soils even the best grower can not equal results attained on fertile soils. Deep cultivation when continued throughout the life of the plantation was apparently highly favorable. Little difference was found between the weaving method of training and that of tying the canes.

Fruit bud studies.—I, The Sultana, C. BARNARD (*Jour. Council Sci. and Indus. Research [Aust.], 5 (1932), No. 1, pp. 47–52*).—Records taken at the Commonwealth Research Station, Merbein, Victoria, during four successive seasons showed that only from 56 to 60 per cent of the buds present on Sultana vines developed into shoots in the spring, and of these from 56 to 70 per cent were fruit-bearing shoots. The proportion of buds developing into shoots was lowest at the base of the cane and increased progressively outward to the distal end. Relatively more buds developed on medium than on long canes. The proportion of fruit buds was low at the base of the cane, increased outwardly, but declined again toward the extreme end in all except the very short canes. Basal fruit buds were differentiated first, those as far out as the sixteenth node appearing almost a month later.

Banana breeding at the Imperial College of Tropical Agriculture, E. E. CHEESMAN (*[Gt. Brit.] Empire Marketing Bd. [Pub.] 47 (1931), pp. 35, pls. 8*).—The Gros Michel banana, possessing many desirable characters except resistance to the destructive Panama disease, was successfully crossed with certain other forms of Musa, especially a fertile species believed to be *M. malaccensis*. One of the resulting hybrids possessed desirable qualities coupled with resistance to the disease. The hybrids did not back-cross readily to the Gros Michel parent, despite its abundant pollen. The small number of seeds obtained, the low percentage of germination, and the proportion of dwarf and weak plants made breeding results rather slow. Some evidence was obtained that fertile species possessing different numbers of chromosomes may upon crossing give rise to a sterile uniform progeny, the explanation being that the chromosome complement of one of the parents may have gone over without reduction with a consequent increase in chromosome number.

The flowering habit and fruit bud formation in Citrus [trans. title], H. NAMBU (*Studia Citrol., 5 (1931), No. 1, pp. 21–32; Eng. abs., pp. 31, 32*).—Under the conditions of northern Taiwan (Formosa), fruit bud differentiation in citrus fruits did not occur except in an everblooming variety Shikikitsu before the early part of December. Flower buds developed on wood of the preceding spring's growth, usually appearing in the axil near the apical end of the shoots.

The discovery of Citrus tachibana in Taiwan (Formosa), and its scientific and industrial significance [trans. title], T. TANAKA (*Studia Citrol., 5 (1931), No. 1, pp. 1–20, figs. 2; Eng. abs., pp. 19, 20*).—The environment of two native citrus species, *C. tachibana* and *C. depressa*, is described with the comment that the habitat of the former species conforms closely with that of the cultivated citrus belt, and that this species may, therefore, be used as an indicator of the most suitable climate for cultivated citrus.

On the effect of potassium upon Citrus fruits [trans. title], I. Takahashi (*Studia Citrol., 5 (1931), No. 1, pp. 37–54; Eng. abs., pp. 53, 54*).—At the Imperial Horticultural Experiment Station, Okitsu, Japan, Satsuma oranges were found to absorb nitrogen, phosphoric acid, and potassium in the ratio of 100: 18: 48. The largest percentage of potash was found in the fruit. The large potash needs of the orange suggested the use of considerable potash fertilizer. However, when potash was supplied in equal amount with nitrogen and phosphorus the growth of Joppa orange seedlings was reduced in comparison with those receiving lesser amounts of potash. Calcium proved beneficial to orange seedlings, a nitrogen-phosphorus-calcium fertilizer giving better results than did a nitrogen-phosphorus-potash mixture.

Potash increased the sugar content of citrus fruits, but the relative increase of acid being still greater the solids-acid ratio was reduced. Spraying citrus trees with potassium carbonate solution also depressed the solids-acid ratio, whereas phosphoric acid gave just the opposite results. It was advised that potash be applied to citrus in moderation and with regard to the phosphorus acid balance.

Irrigation investigations in young grapefruit orchards on the Yuma Mesa, G. E. P. Smith, A. F. Kinnison, and A. G. Carns (*Arizona Sta. Tech. Bul. 37 (1931), pp. [5]+413–591, figs. 36*).—Discussing the general environment obtaining on the Yuma Mesa, an area characterized by very light rainfall, high evaporation, and a sandy porous soil, the authors present a progress report upon studies in a Marsh grapefruit orchard planted in April, 1927, supplemented with observations in commercial orchards.

The nature of the soil was shown in a specific gravity of about 1.6 and a porosity of approximately 40 per cent. Downward movement of water in summer was very rapid, sometimes reaching a depth of 5 ft. or more in 3 hours. The field water-holding capacity for 5- or 6-ft. depths when downward movement had practically ceased was from 5 to 7 per cent in winter. Consumptive use studies indicated that the water may be depleted to about 3 per cent without permanent wilting of the trees.

Trees 10 years of age drew water to a depth of at least 6 ft., but made their greatest demands in the upper 3 ft. Trees in their second year averaged to use about 2 gal. per week during the 26 weeks of summer. A 10-year tree used water of the order of 30 in. depth per year. Irrigation or rain reduced soil temperature throughout the root zone to a maximum of about 36 hours following application. To prevent cessation of root growth in midsummer due to high temperature of the soil, the authors suggest that light irrigation be given every week or so when the soil temperature is 90° F. or above, unless mulch or cover crops are present. Irrigation should simply be sufficient to restore the moisture percentage to the field water-holding capacity.

On plats receiving different numbers of irrigations, the greatest development of trees as measured by trunk girth and also by weight of the entire tree was on the most frequently watered area. The frequently watered trees developed more roots near the soil surface. A correlation of 0.985 ± 0.002 was determined between the air dry weight of the above and below ground portion of the trees with slightly less than half the growth below the soil. Coefficients of 0.989 ± 0.001 and 0.981 ± 0.003 were computed between the area of the cross section of the trunk and the above and below ground portions of the trees, respectively.

Storage experiments with Texas citrus fruit, W. H. Friend and W. J. Bach (*Texas Sta. Bul. 446 (1932), pp. 40, figs. 4*).—Observations on comparable lots of grapefruit and oranges harvested at different stages of maturity from

fertilized and nonfertilized trees and stored at 31–32, 36–37, and 44–45° F. indicated that a temperature of 45° is more satisfactory for grapefruit than lower temperatures when the fruit was of good quality and not overripe. A temperature of 31–32° retarded the development of disease but increased pitting and scald. Duncan grapefruit kept better and held its flavor better than did Marsh. Valencia oranges kept very satisfactorily at 32°, even for so long a period as 20 weeks.

Maturity of fruit was less of a factor in keeping than was environment, particularly the soil and the rains occurring during harvest. Fruits harvested slightly past prime kept poorly. Prestorage treatments, such as holding for 10 days at 70° and wrapping in waxed paper, were highly beneficial, whereas under the conditions employed fungicidal washes were of no particular value. The use of fertilizers high in potash had an unfavorable effect on the keeping quality of the fruit. There were only slight changes in sugars and acids in the juice of fruits held for 16 weeks at 31–32°, nor was the rate of deterioration of the fruit excessively rapid after removal from storage.

Almond varieties in Sicily [trans. title], A. QUATTROCCHI (*Ann. Tec. Agr., 5 (1932), No. 2, I, pp. 140–148, pls. 2*).—Of 10 varieties tested at the agricultural institute at Portici, the Tricala with semi-thick shells and the Nocellara with thick shells are deemed the most valuable because of their resistance to frost and their consistent fruitfulness.

Dahlias in the garden, C. H. CONNORS (*New Jersey Stas. Circ. 258 (1932), pp. 32, figs. 19*).—Superseding an earlier publication (E. S. R., 50, p. 39), this circular presents general information on culture, varieties, and breeding, supplemented with disease notes by R. P. White and insect information by C. C. Hamilton.

The book of roses, G. G. LEWIS (*Boston: Richard G. Badger, 1931, pp. 192, pls. 24, figs. 48*).—General information is presented on the propagation, planting, varieties, protection from pests, etc.

Rose understocks compared at Arlington Farm, G. E. YERKES (In *The American Rose Annual, 1932. Harrisburg, Pa.: Amer. Rose Soc., 1932, pp. 37–41*).—Of 12 rootstocks tested at Arlington Experiment Farm, Va., by budding to seven varieties of hybrid tea roses, namely, Columbia, Mrs. W. C. Miller, Ophelia, Mme. Butterfly, White Killarney, Radiance, and Red Radiance, *Rosa multiflora* and a variation thereof known as Chenault 5892 were outstanding (E. S. R., 57, p. 341). Based on five years' records Chenault-rooted plants produced 343, 886, 731, 694, 508, 818, and 841 blooms, respectively, as compared with 135, 362, 427, 311, 365, 471, and 409 for plants on their own roots. Survival ranged from 100 per cent on Ragged Robin roots to 71.2 per cent on own roots. Radiance was the only variety to grow as large on its own roots as on stocks.

Rose understocks in a four-year test at Shafter, Calif., L. B. SCOTT (In *The American Rose Annual, 1932. Harrisburg, Pa.: Amer. Rose Soc., 1932, pp. 42–44*).—Bloom production records taken over a 4-year period on various hybrid tea roses grown by the U. S. Department of Agriculture at Shafter, Calif., on *Rosa odorata*, Ragged Robin, Manetti, and Paul Scarlet Climber roots showed the Manetti to be the outstanding stock of the four tested. Paul Scarlet Climber had a marked dwarfing effect, both on growth and blooming.

Bulbs for American gardens, J. C. WISTER (*Boston: Stratford Co., 1930, pp. XXV+278, pls. [54], figs. 17*).—This is a book of general information on species, varieties and their classification, history, culture, and other matters of pertinent interest.

Breaking the dormancy of tulip bulbs, D. M. Moore (*Abs. Diss., Ohio State Univ., Columbus, 1929, pp. 11*).—Attempts at the Ohio State University to break the rest period of tulip bulbs by immersing them in warm water were fruitless unless the bulbs had been previously exposed to low temperatures. Cutting bulbs failed to induce development, and no positive results were secured from the use of sulfuric ether fumes. Hydrogen peroxide, potassium chlorate, Javelle water, and potassium nitrate had no significant influence.

However, when Pride of Haarlem bulbs were exposed to cold storage temperatures striking results were attained in shortening the rest period. Bulbs which were never exposed to temperatures below 25° C. appeared incapable of normal development. Catalase activity was greatest in bulbs stored at from 1 to 6° and least in those held at high temperatures without previous exposure to cold. Low temperature increased the sugar content of the bulb, at the same time decreasing that of starch.

Commercial forcing of lilies-of-the-valley, T. M. Whiteman (*U. S. Dept. Agr. Circ. 215 (1932), pp. 20, figs. 12*).—General information is presented on planting stocks, equipment necessary for forcing, methods of planting, growth requirements, preparation for market, costs, etc.

Hardy flower gardening, M. E. Stebbing (*Edinburgh: Grant & Murray, 1931, pp. XII+259, pls. 18, figs. 22*).—This book, designed especially for use in Scotland and northern England, presents in chronological sequence information in regard to the management and care of the garden.

Garden maintenance, H. S. Ortloff and H. B. Raymore (*New York: Macmillan Co., 1932, pp. XIV+302, pls. 9, figs. 21*).—A general discussion regarding soil fertility, plant materials, planting plans, general culture, etc.

Old gardens in and about Philadelphia, J. T. Faris (*Indianapolis: Bobbs-Merrill Co., 1932, pp. 311, pls. 31, [figs.] 4*).—Various historical and interesting gardens are described.

FORESTRY

[Forestry at the Iowa Station] (*Iowa Sta. Rpt. 1931, pp. 95, 96, fig. 1*).—Information is given on results of tests of tree species for the control of erosion and the use of formalin in controlling damping-off in seedbeds, both by G. B. MacDonald.

Ohio Forest News, [April, 1932] (*Ohio Forest News [Ohio Sta.], No. 17 (1932), pp. 8, figs. 2*).—Herein are presented brief comments of a popular nature on forest schools, planting, species, testing, etc.

The use of paper mulch in the forest nursery, P. W. Robbins (*Michigan Sta. Quart. Bul., 14 (1932), No. 4, pp. 277–279*).—The average dry weight of young white pine seedlings mulched with paper was 11.39 g as compared with 10.39 for unmulched controls. Examination showed the mulched trees to have a bushier root system, apparently accounting for the greater weight. The saving in cost of cultivation and weeding under paper practically offset its cost.

The rôle of fire in the redwood region, E. Fritz (*California Sta. Circ. 323 (1932), pp. 23, figs. 12*).—Based on observations extending over a period of years, the author discusses the history and origin of fires, the effect of fire on the trees, on the composition of the forest, on reproduction, on the soil, and on the tourist business. The need of a more constructive attitude on the part of lumber companies and local authorities toward fire control is cited.

Anatomy and physiology of Hevea brasiliensis, W. Bobilioff (*Anatomie en Physiologie van Hevea brasiliensis. Batavia: Ruygrok & Co., 1930, pp. 288, figs. 86*).—A comprehensive discussion upon the anatomical structure and the growth processes, etc., in Hevea.

Lumber and its uses, R. S. KELLOGG (*New York: Sci. Book Corp., 1931, 4. ed., rev. and enl., pp. XIX+378, figs. 101*).—This is the fourth edition, revised and enlarged, of the work previously noted (E. S. R., 50, p. 838).

DISEASES OF PLANTS

[Plant disease investigations] (*Iowa Sta. Rpt. 1931, pp. 39, 40, 41, 42, 43, 45-51, figs. 2*).—Progress reports are given on a number of investigations carried on during the year.

Among the subjects for which data are reported are factors influencing resistance of strains of corn to *Ustilago zeae*, by I. E. Melhus and G. E. Davis; Diplodia dry-rot, by Melhus; chemical treatments of seed corn and a study of the pathogenicity of *Basisporium gallarum* to corn, by C. S. Reddy; inheritance of resistance to Basisporium ear rot and seed rotting, by Reddy and E. W. Lindstrom; survey and identification of the fungi occurring on cornstalks, by J. C. Gilman; physiologic specialization and parasitism of crown rust of oats, and developing new strains of oats resistant to crown rust, by H. C. Murphy; dust fungicides and dry heat treatments for control of seed-borne diseases of wheat and oats, by Reddy; breeding and selection of more disease resistant melons, by J. J. Wilson; the morphology and cytology of wilt-resistant melons, by L. M. Weetman; the biology and control of *Colletotrichum lagenarium* on species of Cucurbitaceae, and propagation of disease-free sweetpotato seed stock, by D. V. Layton; control of seed and soil-borne diseases of the potato, by Reddy; breeding and selection of Iacope cabbage for resistance to cabbage yellows, by Wilson; immunity of a number of lines of Chinese Long cucumber to white pickle mosaic virus, by R. H. Porter; cedar apple rust in Iowa, and the control of nursery diseases, by D. E. Bliss; yellow dwarf and other onion diseases, by Melhus and W. J. Henderson; Cercospora leaf spot of sugar beets, by E. F. Vestal and S. M. Dietz; and minor diseases of the sugar beet in their relation to the Cercospora leaf spot disease, by Reddy.

[Plant disease investigations] (*Massachusetts Sta. Bul. 280 (1932), pp. 201-205, 206, 207, 208, 245, 246*).—Progress reports are given on a number of investigations on plant diseases and their control. Among those reported upon are tobacco black root rot, brown root rot of tobacco, onion diseases, downy mildew of cucumbers, and acetic and pyroligneous acid as soil disinfectants, by W. L. Doran; eggplant wilt, strawberry gold disease, control of greenhouse vegetable diseases, and carnation blight, by E. F. Guba; eradication of nematodes in greenhouse soils by the use of chemicals, by L. H. Jones; plant diseases observed in 1931, not hitherto reported in Massachusetts, and reports of unusual outbreaks of previously reported diseases, by O. C. Boyd; and in cooperation with the U. S. D. A. Bureau of Plant Industry on black root rot and mosaic of tobacco, by C. V. Kightlinger.

Mycologist's report, 1929, F. STELL (*Trinidad and Tobago Dept. Agr. Rpt. 1929, pp. 25-27*).—Cacao witches'-broom disease (*Marasmius perniciosus*) continued to spread, the affected and suspected areas at the end of 1929 totaling more than 44,000 acres. Pod attack continued low, incidence on twigs predominating. Thoroughgoing discovery and eradication of this disease are very difficult. *Theobroma bicolor* and *Herrania* sp. are attacked by *M. perniciosus*. Cacao root disease (*Rosellinia* sp.) is said to be well in hand. Cacao black pod and canker (*Phytophthora* sp.) are less evident than formerly.

Though lime withertip disease (*Gloeosporium limetticolum*) is expected to continue as a limiting factor in districts of high rainfall, fair crops are harvested in areas of low rainfall. Sugarcane mosaic incidence has somewhat

extended recently in the Couva district. Other sugarcane diseases occurring locally, as root diseases (*Marasmius* sp., etc.), and leaf-spot disease (*Leptosphaeria* sp. and *Helminthosporium* sp.), are not yet of economic importance.

Coffee thread blight (*Pellicularia koleroga*) is somewhat prevalent, especially on *Coffea arabica* under deep shade. This is also markedly susceptible to *Omphalia flavida*. *C. excelsa* is susceptible to *Sclerotium coffeicolum*. Losses are heavy in areas of high rainfall. Some planters have had fair success in spraying with resin Bordeaux mixture.

Spraying tests of Sulco V. B., 1 application at 1–50, 5 at 1–100, on sour orange stock of all sizes from seedling to the budding stage affected with scab (*Sporotrichum citri*), showed appreciable reduction of the disease. A tree of Divine mango also sprayed set fruit better than did unsprayed trees.

Control of fungus diseases (*Imp. Col. Trop. Agr. [Trinidad], St. Lucia Agr. Dept. Rpt. 1930, p. 6*).—Cacao root disease (*Rosellinia* sp.) causes the greatest loss in cacao. The fungus has been observed on rough lemon, and in one instance on a damaged root of sour orange. Lime withertip outbreak resulted from a wet January and February. Coconut showed the effect of bud rot, little leaf, bitten leaf, stem bleeding, leaf yellows, withering leaf, and senility.

Report of the institute for plant diseases, 1929–30 [trans. title], SCHANDER (*Jahresber. Preuss. Landw. Vers. u. Forschungsanst. Landsberg a. d. Warthe, 1929–30, pp. 62–91, figs. 2*).—This report on plant diseases and matters related thereto, as influencing conditions and protective measures, consists of sections and subdivisions dealing with crops severally or phases thereof, crop pests, diseases, soil, and weather. Some of these sections or their parts are signed separately by collaborators as follows: Schleusener, Götze, Staar, Krüger, Mestel, Lemke, Mullach, or Bennin.

Diseases of economic plants in the university farm Maksimir [trans. title], V. ŠKORIĆ (*Gospodarsko-Šumarski Fakultet Sveučilišta Kraljevine Jugoslavije u Zagrebu, Spomenica (Facult. Agron. et Forest. Univ. Roy. Yougoslave, Zagreb, Mém.), 1919–1929, pp. 738–746; Eng. abs., p. 746*).—Detailing observations on the occurrence, incidence, and intensity of diseases of cultivated plants during the years 1922–1928, the author notes more particularly the appearance of *Peronospora cytisi* on locust, of *Bacillus lathyri* on pea, and of *Pseudoperonospora humuli* on wild hop.

Division of mycology annual report for 1929, A. SHARPLES (*Straits Settlements and Fed. Malay States Dept. Agr., Gen. Ser. No. 3 (1930), pp. 62–72*).—This report is divided into sections dealing, respectively, with palm diseases, other diseases, soil flora, and miscellaneous.

The account of coconut palm death occurring and of coconut diseases developing as the result of lightning stroke indicates that this cause is a feature of primary importance in connection with certain diseases in the Malay Peninsula. Findings indicated involving the association of *Marasmius palmivorus* with lightning stroke of palms have resulted in recommendations of control measures enabling planters to save numerous palms, so it is now somewhat rare for palms other than the most seriously attacked to die. In stem rot of mature oil palms not less than eight years old the organism appears to enter via the leaf bases, after pruning has been done in gathering the fruit bunches. A *Thielaviopsis* sp. is capable of attacking stem tissue exposed by removal of old leaf bases.

Black stripe of rubber trees may be caused by *Phytophthora palmivora*, *P. meadii*, or *P. heveae* (here referred to as a new species). Patch canker of rubber trees is caused by *P. palmivora* and a Phytophthora undetermined as to species. Pod rot is caused by *P. heveae*. It is thought from evidence referred

to that the great majority of *Phytophthora* spp. growing vigorously under Malayan conditions may be able to produce typical black stripe or patch canker symptoms. Other relations of *Phytophthora* spp. are indicated. Relations of *Pythium* spp. are being studied.

Banana Panama disease studies are outlined as preliminary to a fuller report.

Soil microorganisms studied are discussed briefly, as are also diseases of tea and of sisal. Disease conditions or causes are listed as found on or in sweet pea, melon leaves, vanilla, pomelo, cotton, tomato, orchid, *Carica papaya*, and *Hydnocarpus wightiana*.

Leaf-sap reaction and susceptibility to disease [trans. title], F. WILLE (*Zentbl. Bakt.* [etc.], 2. *Abt.*, 78 (*1929*), *No. 8–15, pp. 244, 245*).—This brief account indicates broadly the nature of a continuation of work done by the author (E. S. R., 59, p. 724) on relations between the acid content of leaf extracts and resistance or immunity of the plant to parasitic attack. The studies relate comparatively to seven conifers, eight varieties of *Vitis vinifera*, and several deciduous plants.

Phosphoric acid and plant disease [trans. title], G. GUITTONNEAU (*Rev. Vitic.*, 72 (*1930*), *No. 1856, pp. 61–68*).—The author details observations supporting the view that certain nutritive deficiencies, particularly that of phosphorus, may lead to very grave conditions in certain shrubby plants of economic value.

Investigations on the fungicidal action of sulphur.—IV, Third progress report, B. T. P. BARKER (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1929, pp. 130–148, pl. 1*).—The first and the second progress report in this series have been noted (E. S. R., 64, p. 349).

The general conclusions are that as used in practice sulfur, to become fungicidally active, must contact with a sulfur-reactive living organism and that a chemical reaction then occurs, eventuating in the formation of a gaseous sulfur compound reacting like hydrogen sulfide and claimed to be highly fungicidal. The living organism in certain cases and under active growth conditions is held to react with sulfur by means of a reducing substance, allegedly a product of the metabolism of the cell.

The work thus far is said to support the conclusion that this property of sulfur reduction is of wide occurrence in the plant kingdom, examples now having been observed among the algae, fungi, mosses, and higher plants. Experimental results noted in this paper indicate that the reaction occurs outside the organism and is effected by means of a substance or substances emerging from the plant. The reducing factor, though not yet identified, is known to be very active chemically, reducing rapidly at ordinary temperatures, besides sulfur, potassium iodate, ferric chloride, silver nitrate, and methylene blue. As regards sulfur, the reduction appears to be more complex than the simple formation of the highly toxic hydrogen sulfide, as the formation of an intermediate and more complex sulfur compound is indicated; but whether or not this is fungicidal is as yet undetermined.

The results of the work here considered are held to suggest that reduction, not oxidation, should be the objective. The sulfur-reducing properties of yeasts are referred to, and it is suggested that the incorporation of these organisms with sulfur sprays and dusts should not be difficult and should result in the continuous production of hydrogen sulfide from the protective coating of sulfur on treated plants during humid, possibly also during dry, conditions; or sulfur-reducing bacteria might prove serviceable in this connection.

Biology of plant-inhabiting parasitic fungi, E. FISCHER and E. GÄUMANN (*Biologie der Pflanzenbewohnenden Parasitischen Pilze. Jena: G. Fischer,*

1929, pp. XII+428, figs. 103).—The first section of this work deals with the conditions antecedent to the establishment of the parasitic relations, the second with the progress of the parasitic relationship within the plant.

The genus Aphelenchus on cultivated plants, H. GOFFART (*Die Aphelenchen der Kulturpflanzen. Berlin: Julius Springer, 1930, pp. V+106, pl. 1, figs. 42*).—This book, No. 4 of the series Monographien zum Pflanzenschutz, edited by H. Morstatt, deals in general with description, development, biology, control, and technics; and more in particular with the true parasites *A. fragariae, A. ritzemabosi, A. ribes, A. subtenuis, A. olesistus, A. olesistus longicollis*, and *A. cocophilus*; the semiparasites *A. parietinus, A. helophilus, A. pseudolesistus, A. tenuicaudatus, A. demani, A. longicaudatus, A. chamelocephalus, A. avenae*, and *A. caprifici*; and the undetermined forms *A. ormerodis* and *A. coffeae*. An alphabetical index of Aphelenchus forms and synonymy, a conspectus of absolute and relative body sizes, and a list of literature complete this account.

Species of Cercospora on Trifolium, Medicago, and Melilotus, J. G. HORSFALL (*Mycologia, 21 (1929), No. 6, pp. 304–312, figs. 3*).—Study of Cercospora specimens obtained from as many members as practicable of Trifolium, Medicago, and Melilotus in the field led the author to the conclusion that the fungus material occurring on *T. agrarium, T. hybridum, T. pratense, T. repens, Medicago lupulina, M. sativa*, and *Melilotus alba* constitutes one species only (unless the one designated as *C. meliloti* be considered as an exception for reasons mentioned). The evidence in support of this conclusion is detailed, with appropriate synonymy. *C. zebrina*, as the oldest name applied, is used to designate the fungus.

Botryosphaeria and Physalospora in the Hawaiian Islands, N. E. STEVENS and C. L. SHEAR (*Mycologia, 21 (1929), No. 6, pp. 313–320, fig. 1*).—The work of collecting fungus material, part of which is here discussed, as done during the winter 1927–28, was promoted chiefly by the U. S. Department of Agriculture with assistance by the Pan Pacific Research Council. The paper discusses *Botryosphaeria* and *Physalospora* in connection with local hosts. The fungi mentioned are considered to be either identical with or closely related to fungi already known elsewhere, and it is suspected that a large proportion of the fungi found locally may prove to be of recent introduction into the Hawaiian Islands.

An undescribed species of Macrophoma and of Volutella occurring on Pachysandra terminalis, W. G. HUTCHINSON (*Mycologia, 21 (1929), No. 3, pp. 131–142, figs. 4*).—Diseased specimens of *P. terminalis* from Yorktown, Va., were found infected with a Macrophoma and a Volutella, supposedly new forms which are dealt with in some detail and technically described respectively as the new species *M. pachysandrae* and *V. pachysandrae*.

The eelworm-gall or root-knot disease, H. A. PITTMAN (*Jour. Dept. Agr. West. Aust., 2. ser., 6 (1929), No. 3, pp. 436–446, figs. 7*).—The nematode (*Caconema radicicola*, formerly known as *Heterodera radicicola*) responsible for root knot on the underground parts of many plants cultivated locally is said to be widely distributed around Perth and to have appeared recently in the light sandy soils of the Geraldton area. The organism is said to be seldom, if ever, found in heavy clay soils but to abound in loose, well-drained, sandy areas in warm situations. The effective method of sterilization is usually impracticable in Western Australia, where the organisms infest numerous economic plants. A list of these is given, with an account of symptoms, effects, life history, and effective control measures. These depend mainly on avoiding the introduction of the organisms, the eradication being expensive except in small areas bearing rather valuable plants.

Root-rots of cereals, H. T. Güssow (*Canada Dept. Agr. Circ. 72 (1929), pp. 5*).—The condition of cereals known as root rot, said to be rather complex, not always definitely determinable, often variable, and reputedly injurious to cereal interests, is herein discussed as to its forms, including take-all, prematurity blight, browning, and Helminthosporium-Fusarium rot.

Control recommendations include alternation with a nonsusceptible crop (oats), fallowing, use of the best seed, early sowing, shallow seeding (from 2 to 3 in. deep), and in general the best cultural practices.

On the pathogenicity of Typhula graminum Karsten [trans. title], H. Tasugi (*Jour. Imp. Agr. Expt. Sta., Nishigahara, Tokyo, Japan, 1 (1930), No. 3, pp. 183–198, pls. 2; Eng. abs., pp. 197, 198*).—The first paper of this series (E. S. R., 66, p. 643), reporting on the morphology and the life history of *T. graminum*, is now followed by a second, dealing with the pathogenicity of that organism as investigated by the use of two methods of inoculation which are briefly described.

All inoculation experiments with *T. graminum* developed positively, indicating that this fungus may be causal, though supposedly weak. Attack was greatly favored by cold, moist weather and particularly by partial immersion in water, warm weather enabling the plant to recover.

Six strains of the fungus are designated as having been isolated individually from hulled barley, naked barley, wheat, *Eleusine indica*, and *Alopecurus fulvus*, respectively. These act similarly on hulled and naked barleys and wheat and indicate no significant differences among them. Degrees of varietal resistance are indicated.

It is thought that snow is not the actual cause of the disease, though low temperature favors its development while checking growth in the cereals and predisposing to invasion.

Netblotch, spotblotch, and leaf-stripe diseases of barley in South Africa, N. J. G. Smith and J. M. Rattray (*So. African Jour. Sci., 27 (1930), pp. 341–351, figs. 4*).—These three diseases, ascribed respectively to *Helminthosporium teres*, *H. sativum* and *H. gramineum*, and claimed to be widely distributed in South Africa, are dealt with in some detail, this account describing further than is commonly done the distinguishing symptoms of each, and including some host-parasite relations. Certain features of conidia of *H. teres* and of *H. gramineum* and of the colonies produced on artificial media are dealt with as of use in distinguishing these two species. *H. sativum* differs from the others in ways indicated.

Saltation in cultures has been observed. Emphasis is laid on the fact that these fungi undergo change with change in environment.

Sorosporium paspali McAlp. on Paspalum scrobiculatum L., kodra smut, A. Sattar (*Imp. Inst. Agr. Research, Pusa, Bul. 201 (1930), pp. 16, pls. 5*).—*P. scrobiculatum*, a millet extensively cultivated in India, is subject to attack by a smut (*S. paspali*) which causes damage in Bihar, possibly also elsewhere in India, and which occurs in Ceylon and in Australia. The symptoms are described in connection with the causal organism.

The spores have a resting stage which is of about 4 months' duration, though about 2 per cent of the spores germinate during that period. The percentage of germination gradually increases, reaching 90 per cent at 9 months. The maximum germination temperature for the spores lies between 34.5 and 37.5° C., the minimum below 19°, the optimum about 30°.

The smut is mainly seed borne, the hyphae being both intercellular and intracellular. The infection may remain in the soil to cause a high incidence

in the succeeding crop, but it may be rendered negligible if rain falls in April to June before planting.

Control can be secured by using smut-free seed; by steeping the seed for one-half hour in 1.5 per cent copper sulfate, and drying before sowing; or by dusting each 10 lbs. of seed grain with 1 oz. powdered copper carbonate. Seed grain after either of the above treatments will keep for at least 2 months unimpaired as to germinability.

Varietal bunt resistance tests, 1928, E. J. LIMBOURN (*Jour. Dept. Agr. West. Aust., 2. ser., 6 (1929), No. 1, pp. 199–207*).—This experimentation, said to have been in continuation of work carried on since 1921, was related to that in the work by Southern and Limbourn noted below, being designed specifically to obtain definite information as to the resistance of wheat varieties to bunt. The work is described with tabulation of results.

Since the start of the variety resistance test in 1921, 153 named wheat varieties have been tested; only one, Genoa (P. 1511), having proved fully resistant in each year tested. Dindilon (P. 1437), Florence (P. 223), and S. H. J. (P. 1445) have appeared highly resistant, showing infection only under adverse conditions and in very light form. The durum, or macaroni, varieties also show high resistance; those tested, including Covelle (P. 1433), Dauno (P. 1544), Huguenot (P. 1366), Kubanka (P. 1211), Sarragolla (P. 158), all showing a comparatively low percentage of infection. Carrabin (P. 1437), showing high resistance under normal conditions, was at first considered a resistant variety, but continued tests have revealed slight susceptibility under certain conditions.

Bunt resistance tests, 1929, E. J. LIMBOURN (*Jour. Dept. Agr. West. Aust., 2. ser., 7 (1930), No. 2, pp. 326, 327*).—Varieties used and results obtained in tests for resistance of wheats to bunt (*Tilletia levis*) are presented in tabular form. Genoa again proved immune, this being the sixth year in which that variety has displayed that quality. It is, however, a very late-maturing variety and can not, it is stated, be recommended for growing commercially.

Copper powders for the prevention of bunt in wheat, B. L. SOUTHERN and E. J. LIMBOURN (*Jour. Dept. Agr. West. Aust., 2. ser., 6 (1929), No. 1, pp. 162–165*).—Investigations made earlier on copper carbonate dusts, as in part previously noted (E. S. R., 61, p. 594), have been followed up in experiments carried out on the same samples with a view to determine the specific reasons for the marked superiority of some powders, and in order to facilitate the fixing of standards of composition. This work is described, and the results are tabulated with discussion.

Some parasitic and non-parasitic causes of "empty" or "tipped" heads in wheat, H. A. PITTMAN (*Jour. Dept. Agr. West. Aust., 2. ser., 7 (1930), No. 1, pp. 153–164, figs. 6*).—The condition of empty or partly empty heads here discussed is considered as largely due to the action of hot, dry winds in blowing through the crop around flowering time and causing a greater transpirational water loss than the root system can make good in time. Also the leaves are supposed to withdraw or divert water from the head to a degree imperiling and annulling the processes normal to the region at this stage. Direct drying out of the tissues by the hot winds is thought often to play a part in the development of the conditions noted.

Measures tending to reduce losses from such wind action include careful preparation and consolidation of light lands by conscientious clearing, a good burn off, and a shallow cultivation with heavy implements before sowing to establish a firm seed bed; the sowing of very early varieties of seed; the use of abundant superphosphate to secure adequate rooting; early and clean fallow-

ing; and the sowing of the seed varieties selected at the right time and in the right amount to conserve available water.

Control of flag smut of wheat by resistant varieties, J. T. Pridham, R. E. P. Dwyer, and R. Hurst (*Agr. Gaz. N. S. Wales, 40 (1929), No. 7, pp. 520–522*).—Crossings credited to W. L. Waterhouse as effected in 1921 of the American immune or highly resistant wheat Red Rock with the local variety Canberra are said to have produced among the resulting strains a few highly resistant ones, though as yet undetermined as to agronomic qualities.

A second American variety, Galgalos, crossed with Federation and with Bena gave progenies which, though not yet fixed as to type, show some forms highly resistant to flag smut and apparently of good agronomic type.

Tests begun in 1923 and extended in 1927 with standard local wheat varieties have given valuable data as to which forms are likely to prove desirable as parents to test out in breeding for more resistant forms. The plans for testing and the results are presented as indicating that from the standpoint of breeding for disease resistance the situation is already well in hand.

Some observations on rust resistance in wheat, J. T. Pridham (*Agr. Gaz. N. S. Wales, 40 (1929), No. 9, pp. 632, 633*).—In the growing season of 1929, said to have been the worst for wheat stem rust since 1916, Cowra and neighboring districts showed the maximum injury. W. L. Waterhouse is credited with having found some forms offering encouragement for their use in breeding tests looking to development of rust resistance, and it is stated that complete resistance to all local forms of wheat stem rust is projected by crossbreeding between the varieties indicated by the results of this investigation. The 1929 season at Cowra is said to have been useful in corroborating data previously obtained and in making further practical observations in this respect.

Market diseases of fruits and vegetables: Tomatoes, peppers, eggplants, G. B. Ramsey and G. K. K. Link (*U. S. Dept. Agr., Misc. Pub. 121 (1932), pp. 44, pls. 11*).—Popular descriptions are given for the identification in the market of diseases of tomatoes, peppers, and eggplants. The diseases are listed alphabetically according to their popular names, the causal factors are described, and control measures for use in the field and in transit are suggested.

Observations on the diseases of market-garden crops in the Vale of Evesham, L. Ogilvie (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1929, pp. 149–154*).—A survey of market-garden crop diseases, commenced in 1928, showed that several obscure disorders were of considerable importance as regards crop plant returns. The present notes deal with asparagus violet root rot (*Helicobasidium purpureum* (*Rhizoctonia crocorum*)), asparagus "sickness" (several fungi isolated), and asparagus rust (*Puccinia asparagi*); dwarf bean dry root rot (*Fusarium martii phaseoli*); pea foot rot (*Fusarium* sp.), bacterial disease (*Pseudomonas pisi*), and downy mildew (*Peronospora viciae*); onion white rot (*Sclerotium cepivorum*) and downy mildew (*Peronospora schleideni*); and aster foot rot (*Fusarium* sp.).

The relation to abacá, or Manila hemp, of the banana-wilt fungus Fusarium cubense EFS., J. B. Leoncio (*Philippine Agr., 19 (1930), No. 1, pp. 27–42, figs. 2*).—In this work, said to be an extension of that done by Ocfemia (E. S. R., 59, p. 844), the author sought to compare the Philippine banana wilt fungus with Brandes' *F. cubense* (E. S. R., 43, p. 848); to ascertain whether the banana wilt Fusarium can affect abacá seedlings; and to compare the symptoms on abacá with those on banana. The work is briefly detailed.

It is concluded that the fungus causing banana wilt in the Philippines is identical with *F. cubense*, which is found to be capable of infecting abacá seed-

lings through injuries of the corm and pseudo-stem but not through uninjured petioles of very young leaves or unfurled foliage. The symptoms produced on Latundan banana are not all produced on abacá seedlings, though these show the loss of turgescence, leaf bunching, yellowing, and corm coloration.

The fungus used in the present study was isolated from banana plants infected with banana wilt. Infection of both abacá and banana seedlings were brought about by growing them in previously sterilized soil inoculated with pure culture of *F. cubense* and in sick soil. Infection by *F. cubense* of abacá seedlings may be obtained by means of normal spores and by artificial injuries. No heart rot was produced by infection.

The symptoms of banana wilt on abacá seedlings are bunching and yellowing of the leaves. The most reliable symptoms on abacá are shown only on cutting the corm. This clearly shows the characteristic coloring of the vascular bundles, which is very similar to that occurring in Latundan when infected with *F. cubense*.

The Fusarium disease of corn, V. B. Mendiola (*Philippine Agr., 19 (1930), No. 2, pp. 79–106, pls. 2, fig. 1*).—The Fusarium disease of corn (*Zea mays*) in the Philippine Islands is said to have been first reported and described as kernel blast by Reinking (E. S. R., 41, p. 841) in 1918, though no work has yet been done on the disease and its organism in the Philippines. This Fusarium, besides attacking all varieties of corn, also attacks sugarcane, and in other places infects conifers, wheat, barley, rye, oats, and the pseudostems and dead floral parts of the banana. Common names applied to this disease are mold, kernel blast, kernel rot, dry rot, pink rot, and splitting disease of corn kernel.

The Fusarium causing this disease of corn seems to have been the first described by Sheldon in 1904 as *F. moniliforme* (E. S. R., 16, p. 571). It is said to be now widely distributed in the United States, Australia, South Africa, Central America, and the Philippines. The disease symptoms and growth are described. Age and hardness of grain hinder infection. A primary source is soil or diseased seed. Entrance is gained via the silks. The disease may be lessened or controlled by seed selection, by crop rotation, and by burning corn residues.

Treatment of cotton root nematode disease [trans. title], A. V. (*Agron. Colon., 19 (1930), No. 146, pp. 45, 46*).—In the vicinity of cotton plants, nematodes (*Heterodera radicicola*) attacking cotton roots find harborage in such plants as *Ageratum* sp. and *Amaranthus* sp. favored by air and light. These nematodes may be controlled by the use of such shading plants as peas, or by use of such disinfectants as carbon disulfide or formol.

The successive distribution of sodium cyanide at 600 kg and of ammonium sulfate at 900 kg per hectare in the soil destroys the nematodes and a wide range of injurious insects as well. The cost is said to be about 1,500 francs per hectare, but the effect lasts during 4 to 5 years. A disadvantage of the treatment is that it causes high soil acidity and hence lowers its fertility. This may be remedied, without injury if care be exercised, by the addition of lime or of wood ash.

Leaf temperatures of cotton plants with Phymatotrichum root rot, W. N. Ezekiel and J. J. Taubenhaus (*Science, 75 (1932), No. 1945, pp. 391, 392*).—Field experiments at the Texas Experiment Station are said to have shown that leaves from plants wilted from *P. omnivorum* root rot were as much as 6.5° F. warmer than air temperature, while leaves from normal plants were usually cooler than air temperature. Series of measurements made with mercury thermometers and by thermocouples showed that in July and September,

1930, leaves from root rot cotton plants averaged about 3° warmer than leaves from normal plants.

The authors utilized this difference in leaf temperatures in diagnosing cotton plants about to succumb to the effects of the disease in investigations on the cotton root rot and its control (E. S. R., 66, p. 45).

The sore-shin disease and its control, TEWFIK FAHMY (*Egypt Min. Agr., Tech and Sci. Serv. Bul. 108 (1931), pp. [2]+24, pls. 7*).—This bulletin, giving a descriptive and historical account of work relating to cotton sore shin disease in Egypt, some information regarding which has been noted (E. S. R., 49, p. 842; 57, p. 348; 61, p. 536; 64, p. 449), states that the reports accumulated are by no means definite. The author has included in the present report his own observations on the conditions under which sore shin occurs.

Of the various effective causes, temperature and soil conditions appear most important, in association with various organisms of which *Rhizoctonia* sp. is supposedly the principal one.

Attempts to control infection by use of seed dressing and steepings have been successful in reducing somewhat the necessity for reseeding, though subnormal temperature may lessen the effectiveness of such measures. Rainfall may be an adverse factor.

The most successful method of controlling the disease appears to be that of sowing the seed, previously soaked in water for 48 hours, in land which is sufficiently moist and which has been brought to a fine degree of tilth.

Potato diseases in Western Australia, H. A. PITTMAN (*Jour. Dept. Agr. West. Aust., 2. ser., 6 (1929), Nos. 2, pp. 246–256, figs. 5; 3, pp. 398–404, figs. 5*).—Figures cited for 1921–1928 show a potato yield averaging only 3.7 tons per acre, although a maximum yield of a little over 23 tons per acre is credited to certified seed with all conditions favorable.

Potato diseases recorded to date as listed include Rhizoctonia scab (*R. solani*); common scab (*Actinomyces scabies*); eelworm scab (*Heterodera radicicola*); silver scurf (*Spondylocladium atrovirens*); dry rot, brown ring, or Fusarium wilt (*F. oxysporum*); early blight (*Macrosporium solani*); bacterial wilt (*Bacillus solanacearum*); Irish blight (*Phytophthora infestans*); blackleg (*B. atrosepticus*); the virus diseases, mosaic, leaf roll, and streak; and the conditions of hollow heart, fleck, and hot formalin injury.

In these two sections attention is called in some detail to Rhizoctonia scab, common scab, and late blight, and to measures appropriate to the control or amelioration of these diseases.

Sources of potato-blackleg infection, J. G. LEACH (*Amer. Potato Jour., 7 (1930), No. 3, pp. 59–64*).—Since the development of potato seed record and certification, it has appeared that many potato blackleg outbreaks occur which can not be explained on the basis of infected seed stock. Investigations carried out during seven years in Minnesota, some features of which have been noted (E. S. R., 53, p. 545; 59, p. 848), have shown at least two additional sources of infection, the soil and the seed-corn maggot, claimed to be of greater importance than infected seed. The author states that his experiments previously referred to (E. S. R., 55, p. 763) disproved the claims of Rosenbaum and Ramsey (E. S. R., 39, p. 456) and of Ramsey (E. S. R., 43, p. 654) that the causal bacteria can not overwinter in the soil. Other claims or findings are cited.

Seed known to be free from blackleg should be used, or else strict roguing, especially late in the season, should be practiced. All seed should be disinfected, as minute lesions may harbor decay bacteria, attract maggots, and increase susceptibility. Cut tubers should be planted quickly to insure good wound-cork

formation. On heavy, undrained, or peat soils subject to wetting, shallow planting should be the rule to secure good wound-cork formation. Crop rotation should be practiced.

The problem of potato scab in Scandinavia [trans. title], (*Nord. Jordbrugsforsk., 1929, No. 4–7, pp. 531–554, figs. 2*).—Accounts are given for Scandinavian and neighboring countries, chiefly as regards the occurrence and relations of potato scab (*Synchytrium endobioticum*), with protective measures, the reports being made separately for Sweden by T. Lindfors, for Norway by I. Jørstad, for Finland by J. I. Liro, and for Denmark by O. Nielson. Other potato diseases, also nematode effects, are indicated as present. Scab outbreaks are mapped for both Norway and Sweden as recently occurring, to the number of about 30 or 35, mainly in the southern portion of these two countries and almost exclusively on or near salt water inlets.

Potato nematodes [trans. title], N. A. KEMNER (*K. Landtbr. Akad. Handl. och Tidskr., 68 (1929), No. 5, pp. 577–650, figs. 10; Eng. abs., pp. 642–646*).—Nematodes attacking potatoes in Sweden closely resemble the English and German forms, of which a brief history is given. In agreement with results credited to English workers, attempts carried on since 1927 to produce infection in beet plants with the Heterodera of potato have failed. The potato-infesting Heterodera is thought to constitute a distinct species, for which the author uses the name *H. schachtii rostochiensis*.

An eelworm disease of potatoes caused by Heterodera schachtii, D. G. O'BRIEN and E. G. PRENTICE (*Scot. Jour. Agr., 13 (1930), No. 4, pp. 415–432, pls. 4, figs. 10*).—Though *H. schachtii*, said to have been first recognized in 1859 as parasitic on sugar beet in Germany and now known to cause beet sickness, has been shown in recent years to be serious on the Continent and in Great Britain (Lancashire, Cheshire, Lincolnshire, Hertfordshire, and Yorkshire in England; Ayrshire, Kirkcudbrightshire, Dunbartonshire, East Lothian, and Ross-shire in Scotland), the authors' experience has been limited in the main to the Ayrshire early potato growing areas. The symptoms (top and root) are described, with an account of secondary infection of the potato rootlets, and of the results on yield, as well as a delineation of the life history of the nematode, a numerical statement of the cyst content of soils, depth of infestation, and effects of soil reaction. The power of adaptation and of spread by the disease is outlined, with statements as to measures for control, whether biological, chemical, rotational, manurial, mechanical (early digging) or combined.

Leaf diseases of the sisal agave [trans. title], [H.] MORSTATT (*Tropenpflanzer, 33 (1930), No. 8, pp. 307–312; 34 (1931), No. 1, pp. 5–13*).—In the earlier of these reports, the author lists with brief discussion sun scorch, two leaf spots, a leaf stem-break, and a withering and drying of the lower leaves. In the second, an account is given of the sudden and general outbreak of an agave leaf disease, a comparative study of which was instituted.

[Sugarcane mosaic in India] (*Madras Dept. Agr. Bul. 92 (1928), pp. 13, pls. 2, fig. 1*).—Of the two condensed accounts here presented, the first, by R. D. Anstead, deals somewhat in general with mosaic (which is said to be rather common in the Madras Presidency), pointing out the importance of disease-free planting material. The second, by S. Sundararaman, indicates the first appearance of sugarcane mosaic in 1925 at Coimbatore and progress made in the direction of protection, 1925–1928.

A note on the control of sugar-cane mosaic in the eastern districts, P. K. DEY (*United Provs. Agra and Oudh, Dept. Agr. Bul. 46 (1929), pp. 7, pls. 4*).—What is said to be the most common type of sugar cane mosaic found

in the eastern districts of the United Provinces, namely, mottling of the leaves, is described. This type affects almost all varieties of canes, the thick forms being the most susceptible. The losses are enormous, extending to complete failure in case of highly susceptible varieties.

"With the present knowledge of the disease, roguing and selection appear to be the only means of checking the spread of the mosaic."

"Dry-rot" of swedes, T. WHITEHEAD and W. A. P. JONES (*Welsh Jour. Agr., 5 (1929), pp. 159–175, pls. 3, figs. 2*).—In this paper, concerned mainly with agricultural aspects of swede dry-rot, a brief account is given of the cultural characters of the fungus involved in that disease. It is held that the name, *Phoma napobrassicae*, originally applied to the causal fungus, must be relinquished in favor of *P. lingam*.

Evidence submitted shows the initial outbreak in a crop to be due largely to diseased material in the manure used and not to infection from other crops or weeds, seed infection if it occurs at all being of little importance. The spread in the field occurs through the agency of wind-borne spores. Slugs do not carry spores, but by rasping the rind they may increase the number of plants affected. The variety Lord Derby is said to be very susceptible, but yellow turnips are distinctly resistant.

The diseases of sweet potatoes in Virginia and methods for their control, H. T. COOK (*Virginia Truck Sta. Bul. 76 (1931), pp. 975–988, figs. 3*).—Popular descriptions are given of a number of diseases to which the sweetpotato is subject, and means are suggested for their control. A calendar program is presented, summarizing the control measures.

Infection experiments with spores of blue mould disease of tobacco, G. P. DARNELL-SMITH (*Agr. Gaz. N. S. Wales, 40 (1929), No. 6, pp. 407, 408*).—It is thought that the fungus associated with tobacco blue mold disease, long known as *Peronospora hyoscyami*, may prove not to be identical with that fungus. Observations indicated include the association with blue mold also of a bacterial infection, which may be due to *Bacterium solanacearum*.

Plants raised from seed of the varieties White Stem Orinoco, Cash, and Warne, the native tobacco plant (*Nicotiana suaveolens*), and a Nicotiana from Lord Howe Island which is closely allied to *N. suaveolens* were proved susceptible; but negative results were obtained from attempts to inoculate *Solanum pseudo-capsicum* and *S. sodomaeum* with the organism.

An outbreak of "downy mildew" (so-called "blue mould") of tobacco in Western Australia, H. A. PITTMAN (*Jour. Dept. Agr. West. Aust., 2. ser., 7 (1930), No. 3, pp. 469–476, figs. 2*).—Downy mildew or blue mold is said to be the most destructive disease with which the Australian tobacco grower has to contend. An account is given of the characteristics, symptoms, life history, and control measures.

Virus diseases of plants, C. G. VINSON (*Missouri Sta. Bul. 310 (1932), p. 41*).—A description is given of two successful methods developed for the purification of the virus fraction occurring in tobacco.

The effect of radiant energy on growth and sporulation in Colletotrichum phomoides, A. H. HUTCHINSON and M. R. ASHTON (*Canad. Jour. Research, 3 (1930), No. 3, pp. 187–199, pl. 1, figs. 11*).—Experimentation carried out on *C. phomoides*, a common cause of tomato ripe rot, showed that the lines of the mercury arc spectrum may be grouped into three classes on the basis of their effects as causing continual retardation, continual stimulation, and primary retardation followed by stimulation.

As regards the effect on spore production two classes of lines are distinguishable in the mercury arc spectrum, having, respectively, a hastening effect on

spore development and no such effect. Spore production is usually hastened by the monochromatic light causing retardation of growth or extreme stimulation, but it appears not to be affected by light moderately stimulative to growth; also an optimum duration appears for the illumination causing acceleration of spore development.

The effect of monochromatic light appears to be exerted upon the protoplasm and not upon the culture. In many cases Colletotrichum shows the effect of irradiation in the culture 10 days after the spores have been illuminated.

A marked similarity appears in the effect upon growth of Colletotrichum, yeast, and Paramecium.

A new Botrytis in vetch [trans. title], J. RODRÍGUEZ SARDIÑA (*Bol. Patol. Veg. y Ent. Agr. [Madrid], 4 (1929), No. 15–18, pp. 93–97, figs. 3*).—An organism associated with a wilt and rot in leaves and stems of *Vicia faba* is described as the new species *B. fabae*.

Epidemic diseases of fruit trees in Illinois, 1922–1928, L. R. TEHON and G. L. STOUT (*Ill. Nat. Hist. Survey Bul., 18 (1930), Art. 3, pp. 415–502, figs. 31*).—Following an introductory section dealing with the general methods used, analysis and limitations of the data, and fruit tree distribution, other general sections include diseases of the apple, as scab (*Endostigme inaequalis*), blotch (*Phyllosticta solitaria*), black rot (*Physalospora malorum*), fire blight (*Bacillus amylovorus*), and rust (*Gymnosporangium juniperi-virginianae*); of the pear, as pear blight (*B. amylovorus*); of the peach, as brown rot (*Sclerotinia cinerea*), bacterial shot hole (*Pseudomonas pruni*), leaf curl (*Exoascus deformans*), and scab (*Cladosporium carpophilum*); and of the cherry and plum, as brown rot (*S. cinerea*), bacterial shot hole, and leaf spot (*Coccomyces* sp).

Spraying and dusting experiments for the season of 1928, F. H. BALLOU and I. P. LEWIS (*Ohio State Hort. Soc. Proc., 62 (1929), pp. 59–72*).—Information regarding this and related work has been noted (E. S. R., 58, p. 248; 61, pp. 449, 685; 62, p. 40; 63, pp. 38, 347, 637; 64, p. 633). Such studies have now been extended over 7 years and have been conducted under unified supervision at points in Ohio for 3 years.

It is concluded that, even in case of apple varieties readily susceptible to scab infection, timely, careful, and thorough use of dependable sprays of moderate concentration in the prebloom stages of fruit bud development and of sprays of modified or more dilute form for afterbloom applications have afforded even under very unfavorable conditions the maximum of scab protection. Even in the case of varieties particularly subject to scab it is found that timely, careful, and thorough dusting, employing from 80 to 90 per cent of superfine sulfur, has given a degree of protection from scab infection. Under favorable conditions it is possible to use modified or dilute spray formulas following the blooming period. Local and variety tests made in 1928 are tabulated.

Brooks' spot caused considerable loss in 1928. Experiences with this disease are tabulated, and it is stated that spores of this disease are readily destroyed by very dilute copper solutions.

Some important orchard diseases, S. A. WINGARD (*Va. State Hort. Soc. Rpt., 35 (1930), pp. 143–151*).—A brief preliminary review of certain orchard soil conditions and managements, with resulting disadvantages, is followed by an account, with discussion, of apple scab (*Venturia inaequalis*), powdery mildew (*Podosphaera leucotricha*), black root rot (*Xylaria mali*), winter injury, fruit russet, and other apple disorders.

Wastage in imported Canadian fruit ([*Gt. Brit.*] *Empire Marketing Bd. [Pub.] 30 (1930), pp. 60, figs. 2*).—The present report deals with a survey using

methods of procedure similar substantially to those described in previous reports.[3]

Wastage types noted in shipments of Canadian apples examined included rotting, scab, internal breakdown, bitter pit, Jonathan spot, surface scald, soft scald, and water core. Of these, rotting due to invasion by a fungus appears to be the most serious, especially where barreling under undue pressure has injured the fruit. It is thought that packing should be delayed until the last practicable date before shipment, and that overmature apples should not be shipped far in barrels as this type of packing particularly favors rotting. Scab and its control constitute a problem particularly serious in eastern Canadian apples of the lower grades. Internal breakdown, observed mainly to be of the Jonathan type, caused losses in varieties from all Provinces, which were serious in the shipment of British Columbian Jonathan apples. The breakdown was more severe in the "extra fancy" grades. A cooperative experimental shipment to test the efficacy of early harvesting to prevent breakdown gave satisfactory control by this plan, the later picked apples developing some breakdown. Apples from trees bearing a heavy crop appeared to be less susceptible than apples from lightly laden trees.

Bitter pit appeared somewhat extensively in British Columbian Cox Orange Pippins and to a less degree in several varieties from all Provinces. Apples picked immaturely appeared particularly susceptible, and delayed harvesting is suggested.

Of pears (examined in quantity only from Ontario), those packed in boxes and trays were generally satisfactory. Barreling appeared liable to cause injury on account of the softness of the fruit.

Plums usually arrived in fair condition but deteriorated rapidly after removal from refrigeration. A physiological breakdown appeared in some varieties, notably Burbank. Some plums appeared to be impaired as to eating quality by too early picking. Precooling and rapid shipment at carefully controlled temperatures appeared desirable particularly in case of the later pickings. It is recommended that all the plum fruits, except those impracticably small, be wrapped in paper individually.

In peaches wastage, usually delayed until ripeness developed, was due mainly to brown rot. Bruising could be lessened by separating the fruits individually so far as practicable.

The economics of spraying fruit trees.—II, The cost of summer and winter washing, 1929 and 1930, J. G. Maynard (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1929, pp. 168–175*).—No material changes in procedure have developed since the publication of the first account of this work (E. S. R., 64, p. 151), except that it has been found to be more economical in nearly all cases to use power equipment than either knapsack sprays or a headland hand pump type of machine, and the account herein given reports a system of metal main layout such as was described in the previous report. Details, dates, conditions, and results of this work are tabulated.

"The main feature of interest is the reduction of cost . . . . It would be hard to overemphasize the importance of this speed of work." A simple procedure is described as claimed to minimize the tendency to blow off metal unions from the rubber tubing under high pressure. A little glacial acetic acid brushed on the cleaned surfaces before uniting is thought to form a very adhesive rubber solution.

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[3] [Gt. Brit.] Empire Marketing Bd. Spec. Rpts. 1 (1927), pp. 15; 3 (1928), pp. 66, figs. 4.

Efficient 4-gun power sprayers, costing originally about £100, can be maintained at a cost of about £20 per year. Where the trees are grown under fairly satisfactory environmental conditions, spraying is considered the most important cultural operation, as its cost is one of the chief expenses.

Brooks' fruit spot, H. C. YOUNG (*Ohio State Hort. Soc. Proc., 62 (1929), pp. 78–80*).—Brooks' fruit spot (*Mycosphaerella pomi*) is said to have been first studied in New Hampshire by Brooks in 1912 and to have caused subsequently rather severe though irregular losses throughout New England and elsewhere. In 1928 these losses were estimated to exceed $750,000 in the southern apple district of Ohio.

A review of what is known of the disease is given. The fungus enters the apple by way of the lenticels, causing near the calyx end of the fruit the characteristic spots, which, however, are not deep. Copper sprays are usually quite effective, and sulfur less reliable. A 2–3 week's spray with a 2–4–50 Bordeaux mixture is favored, although this may be altered to fit conditions which may appear.

My experiences in controlling Brooks' fruit spot, M. G. DICKEY (*Ohio State Hort. Soc. Proc., 62 (1929), pp. 81–55*).—"To summarize, there is no doubt that Bordeaux mixture is effective as a protection against Brooks' spot. Probably copper dust will give results equally as good with less foliage injury. The time of infection is as yet somewhat uncertain and varies according to the season, but the danger period seems to be around four to six weeks after petal fall. Control has not been obtained with less than two thorough applications of copper. The most serious difficulty is that this material is injurious to foliage, and the finish of the fruit. The later we can postpone the copper applications the less serious this injury is likely to be."

A comparison of two species of Plectodiscella, A. E. JENKINS and J. G. HORSFALL (*Mycologia, 21 (1929), No. 1, pp. 44–51, figs. 2*).—Starting with the allegedly inconclusive account presented by Osterwalder of the apple condition considered by that author as Jonathan spot (E. S. R., 58, p. 247), the present authors discuss the similarities and dissimilarities said to have been noted by them between *P. piri*, described by Woronichin (E. S. R., 33, p. 049), and *P. veneta*, described by Burkholder (E. S. R., 38, p. 252) as a new species, the perfect stage of *Gloeosporium venetum*.

Problems in the control of apple scab, R. A. JEHLE (*Peninsula Hort. Soc. [Del.] Trans., 43 (1929), pp. 27–30*).—A review of earlier apple scab history is given in connection with developments locally during the previous few years. The delayed dormant spray may be the most important for control of scab in the occasional years when the spores may ripen unusually early. Also experiences during four years indicate that (on account of early rapid fruit bud development) it is not safe to wait until the pink bud stage for the second spring application.

New dust combinations for apple scab control, H. C. YOUNG (*Ohio State Hort. Soc. Proc., 62 (1929), pp. 73–77*).—In work extending over 5 years and attempting to determine the deficiencies in previous experimentation which proved inadequate to fit the varying conditions in a succession of years, an extensive set of trials was made covering many types of rain periods, using both young and old trees and employing both hand and power dusters. The dusts were applied ahead of periods for which rain was predicted. Leaves were removed before and after each rain, and the adhesion of sulfur was chemically determined. The combinations applied, the rainfall, and the resulting adhesions are tabulated, and general statements and recommendations are made.

It is concluded that in sections where apple scab is not very severe, dusts can safely replace spraying. Where scab has been held in check by sprays in the preblooming period, dusts may be applied afterwards. They may also be used on varieties somewhat resistant to scab, as Grimes, Jonathan, and Baldwin. Nonpoisonous dusts may be used for a prebloom application. Dusts to be applied during rain periods must be carefully timed. After-applications are sometimes advisable. Before infection periods, both sides of the leaves should be dusted. The finer the dust, the better it sticks. Formulas recommended prescribe dusts containing, respectively, an 85–15 sulfur dry-lime-sulfur; a 90–10 sulfur-Manganar; a 75–25 sulfur-Koppers sulfur; and sulfur, 300-mesh-ground-roll, or the standard commercial mixture.

Spraying trials against apple scab.—II, Season 1929, J. G. MAYNARD and H. W. MARSH (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1929, pp. 155–165*).—The trials of 1929, like those of 1928 (E. S. R., 64, p. 151), were carried out on a commercial scale, making use of a power spray and spray guns, and emphasizing thoroughness of application. Large blocks of trees were sprayed. Full records of costs of scab control and of spray damage were kept, in order to formulate recommendations as to reliability and value to orchardists in the western parts of England.

Of the total yield, about 20 tons of fruit on varieties twice sprayed, 90.63 per cent was entirely free from scab. Data are presented relating to Bordeaux injury on James Grieve, Cox Orange Pippin, and Lane Prince Albert. Some costs are detailed. Increased labor efficiency was apparent.

Apple scab at East Malling, M. H. MOORE (*East Malling [Kent] Research Sta. Ann. Rpt., 17 (1929), pt. 1, pp. 72–75, pl. 1*).—The present paper reviews some of the factors conditioning successful apple scab control as brought out in the three years during which investigations of that disease have been conducted at East Malling, chiefly from the point of view of incidence and control. Cox Orange Pippin, being very susceptible to scab and easily injured in various ways by spraying, was the variety chiefly used.

Bordeaux mixture, the best fungicide for control, is unsafe as it causes fairly severe leaf scorch and very severe russeting, even when applied only before blossoming time. Lime-sulfur, necessarily weakened to 1-100 and applied with arsenate three times, gave very good control without fruit damage, and this schedule is recommended for use on Cox Orange Pippin. The efficacy of the preblossom spray is emphasized.

The results show that the critical period for scab development lies in the early stages of seasonal growth for the trees, that is, about the blossoming stage. The seasonal factor is significant, and exceptional weather conditions, as heavy dews, are to be guarded against. It is claimed that there is undoubtedly a critical influence exerted by the rootstock on the degree of infection by apple scab on the scion variety. Results as to the effect of manuring on scab incidence, though available for only one year, indicate the possible effect of the manurial factor on apple scab control.

"Black spot" or "scab" of apples and pears in Western Australia, H. A. PITTMAN (*Jour. Dept. Agr. West. Aust., 2. ser., 7 (1930), No. 2, pp. 241–263, figs. 11*).—Though black spot or scab (*Venturia pyrina*) of pears has been present in Western Australia for many years, causing for 10 or more years a considerable yield reduction, the related disease of apples (*V. inaequalis*) has supposedly been absent until April, 1930, when a small number of Cleopatra apples from Manjimup were found badly affected with *V. inaequalis*, this constituting the first unquestionable record of this disease in Western Australia. Apple black spot or scab is now said to have been recorded from all States of

the Commonwealth, as in England, on the Continent wherever apples are grown, in North America, South Africa, and New Zealand, that is, in nearly all apple-growing areas.

The life history is outlined of the causal organism, known in the perfect stage as *V. inaequalis* and in the nonsexual stage as *Fusicladium dendriticum*. An account is given also of the effects on apple leaves, blooms, fruits, and shoots. Cleopatra and Granny Smith are said to be the only apple varieties yet found to be affected in Western Australia, though other varieties attacked elsewhere in Australia are listed. A comparative account of black spot or scab in apples or pears is given, and a spraying schedule is furnished in tabular form. The final volume of the so-called 3-4-50 Bordeaux mixture should be just 50 gal.

Pear scab (Venturia pyrina), G. W. Wickens (*Jour. Dept. Agr. West. Aust., 2. ser., 6 (1929), No. 2, pp. 220–222, figs. 2*).—Spraying tests outlined show that with Bordeaux mixture of a 6-6-50 strength at the pink blossom stage nearly 100 per cent of the fruit was free from scab, while the unsprayed trees yielded nearly 100 per cent of unmarketable fruit. The second spraying was omitted, except for a few trees sprayed to test for any burning effect of lime-sulfur at a strength of 1 gal. of lime-sulfur in 35 gal. of water after the fruit had set. This spray damaged the foliage and caused heavy fruit drop. The necessity for an effective spray at the pink bud stage is considered as proved.

Experiments for the control of exanthema in Japanese plum trees, V. Cahill (*Jour. Dept. Agr. West. Aust., 2. ser., 6 (1929), No. 3, pp. 388–394, figs. 7*).—Exanthema, a disease said to be common on citrus in Western Australia, is closely paralleled by a disease of the Japanese plum varieties Satsuma and Santa Rosa, though largely confined to trees growing on or near areas showing gravelly soil with stiff subsoil and most common on soils of deficient drainage. The trouble is characterized by the occurrence of dieback and of hard, rough, irregular fissures in the bark with gumming. The cause of exanthema is not definitely known, but it can be prevented by spraying with Bordeaux mixture, or it can be controlled by applications during the winter of crushed copper sulfate at 2.5 lbs. per tree.

Some recent studies on the problem of bacterial spot of peach, J. F. Adams (*Peninsula Hort. Soc. [Del.] Trans., 43 (1929), pp. 33–38*).—Since 1922, when studies were initiated to determine possible methods of retarding the spread of the recently discovered stone fruit shot hole or bacterial spot, some later accounts bearing upon which have been noted (E. S. R., 54, p. 047; 57, p. 449), the disease has become a major problem for peach growers, especially in Sussex County. A narration is given of observation and experience, with tabulation of results in an attempt at control of fruit infection caused by *Bacterium pruni* on the Elberta variety.

A new functional change in refrigerated peaches [trans. title], F. Scurti and L. Pavarino (*Ann. Sper. Agr. [Italy], 4 (1930), pp. 25–38, pls. 9*).—Peaches of the fall variety San Martino, cultivated in the environs of Turin, show in cold storage at 1° C. a discoloration of the pulp which progresses from the seed toward the surface during 10 to 30 days, showing phases of degeneration which are described in contrast with the conditions in the unaltered fruit. In the advanced stages the parts visibly altered yield *Rhizopus nigricans* with species of Trichothecium, Mucor, Cladosporium, and Penicillium. The suggestion is made that the name "male raggiante" be provisionally applied to this fruit condition.

Supplementary note on the control of black currant leaf spot, R. W. Marsh and J. G. Maynard (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1929, pp. 166, 167*).—Previously (E. S. R., 64, p. 151) the first results of a

spraying method for control of black currant leaf spot were reported. The authors now report that the control bushes suffered complete defoliation by early September, the sprayed bushes retaining their foliage until the time of normal leaf fall (October-November). The crop weights showed an increase of the sprayed over the unsprayed rows of 20 per cent due to the spraying in 1928.

The results obtained in 1929 showed clearly the crop loss due to attacks of black currant leaf spot, the value of the Bordeaux spray in the control of this disease, the importance of applying the spray as soon as possible after cropping, and the possibility of arresting the disease by an application of Bordeaux mixture even if unavoidably delayed until after the beginning of slight defoliation in August.

Diseases of the raspberry, G. H. BERKELEY (*Canada Dept. Agr. Pamphlet 120, n. ser. (1930), pp. 25, figs. 12*).—This pamphlet, listed as No. 3 of the series Studies in Fruit Diseases, and as a revision of Pamphlet No. 72, new series (E. S. R., 57, p. 155), adds to the subjects dealt with in that account consideration of spur blight (*Didymella applanata*), crown gall (*Pseudomonas tumefaciens*), and anthracnose (*Plectodiscella veneta*), with discussion as to certified raspberry stock.

[**Excrescences of grapevines**] (*Rev. Vitic., 72 (1930), No. 1855, p. 13*).—Following the frosts of the previous season, grapevines showed forms of injury supposedly related thereto though partly to other and very diverse causes. These forms consisted in excrescences developing as the sap rose, though more particularly noticeable after leaf fall. Some appearances suggested crown gall as caused by *Bacillus tumefaciens*. In numerous cases it appeared that the excrescences were ascribable to the return of the sap due to destruction of the normal buds by frost.

Banana fruit diseases, C. W. WARDLAW (*Trop. Agr. [Trinidad], 7 (1930), No. 5, pp. 115-119*).—This brief listing and review of the literature on fungus diseases of banana fruits is said to be preliminary to work on this subject being carried out at the Low Temperature Research Station of the Imperial College of Tropical Agriculture, Trinidad. An essay is made to discuss the principal fungi involved in diseases of the banana fruit, to indicate salient features of attack, and to describe favoring conditions. The organisms thus briefly discussed include *Gloeosporium musarum*, *Cercospora musarum*, *Macrophoma musae*, *Verticillium* sp., *Thielaviopsis paradoxa*, and *Fusarium* spp.

Panama disease of bananas, C. W. WARDLAW and L. P. MCGUIRE ([*Gt. Brit.*] *Empire Marketing Bd.* [*Pub.*] *20 (1929), pp. 97, figs. 30*).—This account, presented in two sections by the authors separately, details phases of the work referred to previously by Wardlaw (E. S. R., 64, p. 352).

Wardlaw details an account of his visits to Barbados, St. Lucia, Costa Rica, Guatemala, British Honduras, Jamaica, Colombia, and Panama. He states that Panama disease investigation is of great complexity, both mycologically and in relation to the deterioration of virgin soils. This disease is not necessarily the only or in all cases the principal factor in the large scale abandonment of banana culture. The adequate solution requires detailed pathological and physiological studies, together with careful observations on the behavior of virgin soils under intensive and continuous single crop exploitation.

McGuire reports on his visits to banana lands in Costa Rica, Almirante in northern Panama, and Jamaica, and to Colombia where the disease has not yet appeared. It is believed that as a substitute for the susceptible Gros Michel, the Lacatan is the most suitable variety.

Panama disease research, C. W. Wardlaw (*Trop. Agr.* [*Trinidad*], *7* (*1930*), *No. 10, pp. 278-281*).—This is a brief discussion of the results obtained in the study referred to above as related to field conditions.

Investigations on Panama disease in Malaya, F. S. Ward (*Straits Settlements and Fed. Malay States Dept. Agr., Sci. Ser. No. 2* (*1930*), *pp. [4]+26, pls. 4; abs. in Malayan Agr. Jour., 18* (*1930*), *No. 10, p. 509*).—In 1927 the presence of Panama disease of banana in the Malay Peninsula was definitely established, when the causal fungus, *Fusarium cubense*, was isolated in Johore. Two types of disease were present, Panama disease and a bacterial disease; the vascular system being so affected that the external symptoms were practically the same for each, though the internal symptoms were severally characteristic.

In the Malay Peninsula there appear to be two types of the disease, described respectively as an acute form showing complete arrest of growth soon followed by death, and a chronic form in which the symptoms appear earlier and progress more slowly. The internal symptoms differ in degree.

The disease is favored by damp conditions and deficient drainage. The most vigorous growth occurs at 20° C.

Comparison is made in some detail between the symptoms of Panama disease and those of other vascular disease of the banana, also regarding susceptibilities. Detailed description is also given of each of the four Fusarium strains existing in the Malay Peninsula which are pathogenic to the banana.

It appears that immunization through the breeding of resistant but desirable varieties is to be looked to as the main solution of the problem presented by the Panama disease of banana in the Malay Peninsula.

Study of a Fusarium isolated from wilted plantains, C. R. Ayyangar (*Madras Agr. Dept. Yearbook 1929, pp. 16-21, pl. 1*).—In 1927, a wilt of bananas appeared in a village near Madura, killing nearly 30 per cent of the plants, and in another near-by village. Only the variety Chinna mondan, cultivated for its raw fruits, is so far found to be susceptible. The development of the symptoms is described, these symptoms being said to agree somewhat with those previously noted by Brandes for *F. cubense inodoratum* (E. S. R., 43, p. 848) as the cause of banana disease.

Exanthema of citrus in New South Wales, F. C. McCleery (*Agr. Gaz. N. S. Wales, 40* (*1929*), *Nos. 6, pp. 397-406, figs. 4; 7, pp. 523-534, figs. 5*).—Citrus exanthema, known in New South Wales at least as early as 1909 and now considered the most important of citrus diseases in coastal areas, is particularly prevalent in the Mangrove Mountain, Gosford, Wyong, and Dora Creek districts and is present in isolated areas in the Hills districts of the county of Cumberland. It is supposed to be connected with malnutrition. All citrus types are liable to the disease, but the gross symptoms are different and typical separately for orange, lemon, and mandarin. The diagnostic characters are those of gumming, as bark excrescences, stained terminal twigs, gum pockets, and marked fruits. A pronounced twig die-back may be present. The most general symptoms are a bunching and a dark green color of the foliage. The trouble appears to be favored by lack of drainage and by the presence of hardpan. It is very definitely associated with sandy soil types in New South Wales, where the addition of organic matter proves beneficial, though cultivation appears to be without effect.

Experiments are reported in which a very pronounced and uniform recovery from exanthema occurred in case of Washington Navel oranges and of Sweet Rind lemons as a result of single spray applications of 6-4-50 and 6-4-100 Bordeaux-oil emulsion at blossoming in October. The spray was somewhat less

effective with mandarins. A small test with copper sulfate as a soil dressing with common oranges also proved effective. Recommendations favor the use of 6-4-100 Bordeaux-oil emulsion, preferably at the October blossoming, or of copper sulfate at from 1 to 2 lbs. per tree of the age from 6 to 8 years, if applied in late winter or early spring. Farmyard manure, abattoir waste, and green manure cover crops are recommended.

Lemon scab and its control, F. C. McCleery (*Agr. Gaz. N. S. Wales, 41 (1930), No. 1, pp. 27–30, figs. 2*).—Lemon scab, causing annually considerable (even perhaps the principal) losses to lemon interests in the coastal districts of New South Wales, and appearing in connection with a fungus said to be closely related to or identical with that described from South Africa as *Sporotrichum citri* or from America as *Sphaceloma fawcettii*, is said to be readily controllable locally by use of a Bordeaux spray applied to the blossoms after half but not all of the petals have fallen.

A coffee-bean disease, G. B. Wallace (*Trop. Agr. [Trinidad], 7 (1930), No. 5, p. 141*).—It is stated that an injury of green and of red coffee cherries in which the beans alone suffer has been observed in Tanganyika Territory for some time. This condition, which, it is said, has been credited in the literature to the coffee bug *Antestia lineaticollis*, has been found by the author in association with a fungus allied to the Nematospora named by Ashby and Nowell (E. S. R., 58, p. 851). According to accumulating evidence, this is distributed by Antestia. The disease may destroy as high as 95 per cent of the beans in ripe cherries. It is said to be distinguishable from *Colletotrichum coffeanum*.

Observations on the fungus Moniliopsis aderholdi Ruhl. [trans. title], K. Jankowska (*Pam. Państ. Inst. Nauk. Gosp. Wiejsk. Pulawach (Mém. Inst. Natl. Polon. Écon. Rurale Pulawy), 11 (1930), No. 1, pp. 61–69, figs. 2; Eng. abs., pp. 68, 69*).—Data are given on the biology of *M. aderholdi*, which appeared in a greenhouse in Pulawy, causing heavy loss during 1927–28 due to attacks on seedlings of begonia, petunia, and lobelia. The fungus shows no specialization in its choice of substrata. It grows freely on seedlings of several plants in nature. In pure culture, under controlled conditions, it grows on blotting paper, on linden tree leaves, and even on sterilized water. Of agar agar substrata, those containing mineral salts and glucose and lying within the pH range 5.8 to 6.2 appeared optimal, though no great differences developed within pH 5.4 to 6.8. The soil reaction is inferred to have approximately a comparable range. The temperature range lay between 6 or 7 and 25° C. Increment-temperature ranges are indicated. Supposedly, mycelium of Moniliopsis may live under natural conditions saprophytically, becoming injurious only when high temperature and high humidity tend to cause luxuriant growth. The pseudosclerotia carry the organism over both cold and dryness, germinating even when one year old, but only scantily, and after soaking in water, in 6 or 7 days; though at an age of 7 months only 12 hours are required and a fresh sclerotium when put in water may germinate in less than 1 hour. The pseudosclerotia are very resistant to cold.

The lily disease investigation fellowship, C. E. F. Guterman (*Hort. Soc. New York, Yearbook, 1929, pp. 34–37*).—Several cross inoculations have shown that the virus which is responsible for lily mosaic is, with a single exception, confined to the genus Lilium. The vector was found to be an aphid, one individual of which is able to transmit the disease to a healthy plant. The vector is not satisfactorily controlled by spraying, but the disease can be controlled by roguing.

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Rotting of lily bulbs in transit or in storage is due to the activity of two organisms, both wound parasites. Mercury dusts reduced the incidence almost to zero.

For control of Botrytis blight, copper-lime dust outranked all other applications, giving excellent control when numerous light applications were used to cover all new growth.

Diseases of lilies, C. E. F. GUTERMAN (*Hort. Soc. New York, Yearbook, 1930, pp. 51–102, figs. 11*).—It is the purpose of this article to present all of the available information as to known diseases of lilies in the United States, the various diseases being arranged in a sequence corresponding to their supposed relative importance. The list includes in order "mosaic, Botrytis blight, yellow flat, bulb rots, the bulb mite, limber neck, rust, frost injury, stump rot, foot rot, noninfectious chloroses, brown tip, and a few other diseases of minor importance. The symptoms are described for each disease, and in most cases are figured as well. Life histories are discussed, and various methods for control are recommended."

Rose-disease investigations, [I, II] (In *The American Rose Annual. Harrisburg, Pa.: Amer. Rose Soc., 1930, pp. 75–79; 1931, pp. 65–80, fig. 1*).—"Active prosecution of investigations under the terms of the fellowship established by the American Rose Society with Cornell University began on April 1, 1929."

First progress report, L. M. Massey and L. J. Meyer.—The field experiments looked mainly to the development of better working methods and control of black spot and mildew, and of practical control methods for brown canker, brand canker, and common canker. Varieties tested included Dame Edith Helen, Souvenir de George Beckwith, Mme. Butterfly, Edel, and Lady Alice Stanley. The canker diseases were absent, but it is definitely stated that fungicides are available to control rose black spot. All of the copper sprays and liquid lime-sulfur 1–50 caused some injury to early growth, and that from the copper sprays was apparent throughout the summer. Finely divided sulfur again controlled black spot without evident blossom injury.

Second progress report, L. M. Massey and B. Parsons.—The data from the work of the first two seasons is detailed with tabulations, an account of weather conditions, and discussion. In both years black spot was better controlled by the sulfur dusts than by other materials. Brown canker data were limited by the rarity of the occurrence of the disease, but the limited results obtained encouraged the use of sprays and dusts, especially those containing fungicidal sulfur. Other materials and tests are briefly discussed.

The large leaf spot of chestnut and oak associated with Monochaetia desmazierii, G. G. HEDGCOCK (*Mycologia, 21 (1929), No. 6, pp. 324, 325*).—The so-called large leaf spot of chestnut and of oak, described in 1912 by Graves (E. S. R., 28, p. 55) as due to *M. desmazierii*, has been studied since that year by the present author, who states that this disease causes occasionally to the foliage of the trees considerable injury, which, however, occurs so late that the trees having made their growth suffer comparatively little. A list is given which shows this fungus to be always present on the characteristic large leaf spots of 18 different species within 6 genera in 10 States, though it is admitted that the parasitic activity of the fungus has never yet been actually established.

Dasyscypha agassizii on Pinus strobus, W. H. SNELL (*Mycologia, 21 (1929), No. 5, pp. 235–242, pl. 1*).—The fungus *D. agassizii*, said to have been known previously as on *Abies balsamea*, was found to be very abundant on planted *P. strobus* (especially on blister rust cankers), usual on *A. balsamea*, and

present on *Tsuga canadensis*, *P. monticola*, *Picea rubra*, and *P. mariana*, possibly also on *Pseudotsuga taxifolia*.

Recent studies in life conditions for wood-destroying fungi, II [trans. title], W. BAVENDAMM (*Centbl. Bakt.* [etc.], *2. Abt.*, *76* (*1928*), *No. 8-14*, *pp. 172–227*, *pls. 3*).—Concluding an account of further work along the lines previously noted (E. S. R., 67, p. 48), the author states that the tannin has the property of severely limiting growth in all wood-destroying fungi, a 2 per cent addition of tannin to ordinary culture media usually being sufficient for the purpose. Of the saprophytes, *Merulius lacrymans* is, in contrast with *Coniophora cerebella*, particularly sensitive to tannin. The brown coloration is described as being significant, both as to the kind of rot and particularly as regards the important part played in humus formation.

Sap stains of wood and their prevention, E. E. HUBERT (*Washington: U. S. Dept. Com., Natl. Com. Wood Util., 1929, pp. VIII+77, figs. 36*).—This bulletin, said to represent detailed studies carried on during some years from both the scientific and the practical viewpoint, discusses in detail, along with other causes of deterioration of woods, the action of certain fungi. A key is given for the identification of these organisms, which as named include *Ceratostomella pilifera*, *Lasiosphaeria pezizula*, *Penicillium divaricatum*, *P. piniphilum*, *Fusarium negundi*, *F. roseum*, *Torula ligniperda*, *Sclerotiopsis* spp., *Hormodendron* spp., *Hormiscium gelatinosum*, *Graphium* spp., *Chlorosplenium aeruginascens*, and *C. aeruginosum*.

ECONOMIC ZOOLOGY—ENTOMOLOGY

The fundamentals and laws of agricultural and forest zoology, particularly entomology, I, II, K. FRIEDERICHS ET AL. (*Die Grundfragen und Gesetzmässigkeiten der Land- und Forstwirtschaftlichen Zoologie Insbesondere der Entomologie. Berlin: Paul Parey, 1930, vols. 1, pp. XI+419+[1], figs. 127; 2, pp. VI+463, figs. 166*).—The ecological phase is dealt with in volume 1 and the economic in volume 2. Contributions by E. Martini, L. O. Howard, K. Friederichs and E. Alfonsus, and H. Prell are included. A classified bibliography is appended (pp. 434–443).

Animal pests of useful plants, II, H. BLUNCK, F. BODENHEIMER, C. BÖRNER, K. FRIEDERICHS, F. HEIKERTINGER, J. JEGEN, H. KLEINE, L. LINDINGER, H. SACHTLEBEN, F. A. SCHILDER, W. SPEYER, and W. TRAPPMANN, edited by L. REH (*Handbuch der Pflanzenkrankheiten*, begründet von P. SORAUER. *V. Band, 2. Hälfte, Tierische Schädlinge an Nutzpflanzen, II. Teil. Berlin: Paul Parey, 1932, 4. ed., rev., vol. 5, pt. 2, pp. [XV]+417–1032, figs. 283*).—This continuation of the volume previously noted (E. S. R., 60, p. 161) deals further with the Hymenoptera (pp. 417–420) and with the Hemiptera (pp. 420–750) and Vertebrata, including Reptilia (pp. 751–753), Aves (pp. 753–846), and Mammalia (pp. 847–962).

Biennial report of the Board of Game Commissioners, J. J. SLAUTTERBACK (*Penn. Bd. Game Commrs. Bien. Rpt. 1929–30, pp. 53, figs. 8*).—This is a report of the propagation of and protective work, etc., with game during the 1929–1930 biennium.

Experimental Fox Ranch, Summerside, P. E. I.: Report of the superintendent, G. E. SMITH (*Canada Expt. Farms, Expt. Fox Ranch, Summerside (P. E. I.), Rpt. Supt. 1928–1930, pp. 63, figs. 8*).—This report considers factors controlling reproduction with silver foxes; seasonal nutritional requirements of silver foxes; inheritance with silver foxes; influence of cod-liver oil; ex-

perimental work feeding raw cereal products, cooked cereal ration, frozen rabbit ration, Swift meat ration, and purina chow ration; flotation of worm eggs in salt solutions; physiological effect of vermicides; control of lungworm infestation; control of bladder worm infestation; physiological effect of aphrodisiacs; polygamous mating; temperature of fox nests; maximum and minimum temperatures; digestibility of foodstuffs; and raw cereal rations.

The flying fox (Pteropus) in Australia, F. N. RATCLIFFE (*Aust. Council Sci. and Indus. Research Bul. 53 (1931), pp. 81, figs. 5*).—Studies of the flying foxes (*Pteropus* spp.), or fruit bats (Chiroptera), which have since the earliest days of settlement attacked cultivated fruit along the eastern coast of Australia, are reported upon at length, including their biology and ecology, economic importance, and possibilities of control.

Food of the muskrat in summer, R. K. ENDERS (*Ohio Jour. Sci., 32 (1932), No. 1, pp. 21–30*).—A report of studies conducted in Ohio during the summer of 1930, with an annotated list of food plants.

The scientific aspects of rabbit breeding, J. N. PICKARD and F. A. E. CREW (*London: Watmoughs, 1931, pp. IX+122, pls. 12, figs. 14*).—A handbook of information, particularly from the genetic side.

First International Conference on the Rat, edited by G. PETIT (*I. Conférence Internationale du Rat, Paris, 1928. Paris: Vigot Bros., 1931, pp. 391, figs. [83]*).—This is a report of the proceedings of the International Conference on the Rat, held at Paris and Havre in May, 1928. It includes contributions from various countries dealing with the rat and its economic and sanitary importance and control.

Canned rat baits, C. R. FELLERS and E. M. MILLS (*Massachusetts Sta. Bul. 280 (1932), p. 227*).—The perfection in cooperation with the U. S. D. A. Bureau of Biological Survey is noted of a process for canning cereals, fish, and meat mixed with red squill.

Effectiveness in nature of the so-called protective adaptations in the animal kingdom, chiefly as illustrated by the food habits of Nearctic birds, W. L. MCATEE (*Smithsn. Misc. Collect., 85 (1932), No. 7, pp. 201*).—Following an introduction and a discussion of protective adaptations, the author deals at length with the animals eaten by Nearctic birds. The data cited and manner of obtaining the same are briefly considered, followed by a detailed account of identifications of animal food, the arrangement being by orders and lower groups (pp. 8–135). The discussion which follows (pp. 135–143) considers the indiscriminancy of predators other than birds, the more theoretical aspects of indiscriminancy by predators, the indiscriminancy of natural checks other than predators, and the relative importance of natural checks. A bibliography of the literature relating to food habits (pp. 145–201), the arrangement being largely systematic according to the animal eaten, is included.

The art of bird-watching: A practical guide to field observation, E. M. NICHOLSON (*London: H. F. & G. Witherby, 1931, pp. 218, pls. 6, figs. 14*).—The several chapters of this work are devoted, respectively, to equipment, how bird watching is done, bird census work, contemporary tasks of bird watching, the field for bird watching, and the yield of bird watching.

The birds about us, L. P. ROBERT (*Les Oiseaux de chez Nous. Neuchatel: Delachaux & Niestlé, [1929?], vols. 1, pp. 32, pls. 23; 2, pp. 35, pls. 22; [1931?], vol. 3, pp. [2]+35, pls. 24*).—Small handbooks with descriptions, by P. Robert, Jr., of 110 forms, are accompanied by portfolios of mounted, colored plates, 15 by 21 in. in size.

The bird book: Bird neighbors and birds that hunt and are hunted, N. BLANCHAN (*Garden City, N. Y.: Doubleday, Doran & Co., 1932, pp. XII+498,*

pls. 68, figs. 59).—In this work the information given in Bird Neighbors (the common birds) (pp. 1–197), first issued in 1922, and in Birds That Hunt and Are Hunted (the game birds and birds of prey) (pp. 199–485), first issued in 1905, is brought together and illustrated in colors from drawings by N. M. Pairpoint.

Florida bird life, A. H. Howell ([*Tallahassee*]: *Fla. Dept. Game and Fresh Water Fish, 1932, pp. XXIV+579, pls. 58, figs. 72*).—This work, based upon field studies and a review of the literature extending over a period of 12 years, was published by the Florida Department of Game and Fresh Water Fish in cooperation with the U. S. D. A. Bureau of Biological Survey.

Following a check list of the birds of Florida (pp. XV–XXIV) and a brief introduction (pp. 1–5), the author takes up the history of Florida ornithology (pp. 6–37) and gives a list of the birds originally described from Florida, including the type localities (pp. 38–41). The history of bird protection in Florida is dealt with by R. W. Williams (pp. 42–58). The physiographic regions of Florida are considered (pp. 59–65), followed by a discussion of the life zones of Florida (pp. 66–72), presented in connection with an attached map of the life zones of the State, namely, the Lower Austral Zone with both Louisianian and Floridian faunas and the Tropical Zone. The birds of Florida (indicated by their common and scientific names) are then reported upon in detail (pp. 73–472), including recognition marks, range, distribution in the State, haunts and habits, and food so far as known. The general ranges of the species have been abridged from the fourth edition of the American Ornithologists' Union's Check-List of North American Birds (E. S. R., 66, p. 845), and the scientific names agree in most cases with that list. The list of Florida birds thus treated numbers 423, comprising 362 species and 61 additional subspecies. A hypothetical list of 12 species of birds that have been recorded on evidence considered to be insufficient is appended (pp. 473–475.)

The birds of the State are divided by the author into the following categories: Permanent residents, 134; summer residents (departing southward in autumn), 31—a total of 165 breeding species and subspecies; winter residents (those species that arrive in autumn from more northern breeding grounds), 136; regular transient visitors (migratory species passing through the State in spring and fall), 69; accidental or casual visitors, 50; and species extinct within historic times, 3. It is pointed out that while the number of breeding species is not large in comparison with that of some other States, the combined lists of winter residents and of permanent residents totals 270—an unusually large winter population.

A bibliography of Florida ornithology (pp. 476–555), bibliographical references to contributors to Florida ornithology (pp. 556, 557), and an index (pp. 559–579) are included. The 37 illustrations in colors of the birds described, several forms appearing on each plate and in many instances both sexes, are from original paintings in oil and water color by F. L. Jaques.

The birds of Louisiana (*La. Dept. Conserv. Bul. 20 (1931), pp. 598, pls. 7, figs. 231*).—This practical account of the birds of Louisiana, presented under the headings of 20 orders represented, is said to have been compiled especially by S. C. Arthur, former director of the wild life division, and the staff of the department of conservation.

The birds of French Indo-China, J. Delacour and P. Jabouille (*Les Oiseaux de l'Indochine Française. Paris: Exposition Colon. Internatl., 1931, vols. 1, pp. LVI+279+XLVI, pls. 14, figs. 3; 2, pp. 339+LXI, pls. 18; 3, pp. 348+LXXIII, pls. 23; 4, pp. 296+LXVI, pls. 17*).—The introductory part of this work includes a discussion of the nomenclature and classification, a brief

history, an account of the geography, a list of the principal localities mentioned in the course of the work, synonymy, and a bibliography. The species and subspecies, arranged by orders, are then taken up, a description including the size, habitat, and adaptation of each form being included. Colored plates, 67 in number, reproduce paintings by H. Grönvold of one or more forms. Each volume includes a systematic and an alphabetical index.

Pheasants, W. B. TEGETMEIER (*London: The Field, [1931], pp. XV+268, pls. 20, figs. 16*).—This work deals with the natural history of the pheasant (pp. 1–44); management in preserves (pp. 45–77); management in confinement (pp. 78–141); *diseases of pheasants, by H. H. Smith* (pp. 142–166); pheasants adapted to the covert (pp. 167–221); and pheasants adapted to the aviary (pp. 222–259).

The prairie horned lark, G. B. PICKWELL (*Acad. Sci. St. Louis, Trans., 27 (1931), pp. [6]+160, pls. 34, figs. 18*).—A report is made of studies of the life history and habits of this lark (*Otocoris alpestris praticola* Hensh.), based upon field observations in Illinois and New York and a review of the literature, an eight-page list of which is included.

Size as a species characteristic in coccidia: Variation under diverse conditions of infection, E. E. JONES (*Arch. Protistenk., 76 (1932), No. 1, pp. 130–170, figs. 5*).—The experiments here reported were undertaken to determine the extent to which size differences may be used as a criterion for the recognition of species of coccidia. The range of variation within the species *Eimeria acervulina*, *E. maxima*, and *E. tenella* under diverse environmental conditions was studied to ascertain the effect of such factors as age and breed of host and stage and severity of the infection. An attempt was also made to produce a race modified in size by providing opportunities for cross breeding between two species, *E. acervulina* and *E. maxima*, differing markedly in size. Nine oocysts intermediate in size between the two parent species appeared in the F_1 generation and three in the F_2, two of which appeared on the fifth day. The possibility of these being true hybrids, or very large *E. acervulina* oocysts, is discussed. Since there is no convincing evidence that hybridization occurred, it is believed justifiable to consider the two parent strains here employed as true species.

"In view of the variations in size encountered in these experiments in strains of oocysts resulting from infections with a single organism, it is felt that the use of size as a criterion in the establishment of new species of coccidia is valid only under certain conditions. When a distribution curve based on a sufficiently large series of measurements is symmetrical and continuous, it may be considered as satisfying these conditions. But when the curve is discontinuous or major and minor peaks are encountered, it must be demonstrated by other than statistical methods whether one species or more than one is present in the material measured."

Fundamentals of insect life, C. L. METCALF and W. P. FLINT (*New York and London: McGraw-Hill Book Co., 1932, pp. XI+581, figs. 315*).—In the preparation of this work, which emphasizes the biological rather than the agricultural side, the first 10 chapters of the work previously noted (E. S. R., 60, p. 648) have been completely revised and brought up to date and much new material added. Chapter 8, on the orders of Insecta, is said to have been entirely rewritten and greatly enlarged to include brief characterizations of the more important families of insects, and considerable new material has been added to chapters 9 and 10. A classified bibliography is included.

Insects and their injuries, E. DONGÉ and P. ESTIOT, rev. by E. SÉGUY (*Les Insectes et Leurs Dégâts. Paris: Paul Lechevalier & Son, 1931, 2. ed., rev., pp.*

CCLXXXVI+148, pls. 103, figs. [218]).—This is the second revised edition of the work previously noted (E. S. R., 46, p. 456).

The respiration of insects, V. B. WIGGLESWORTH (*Biol. Rev. and Biol. Proc. Cambridge Phil. Soc., 6 (1931), No. 2, pp. 181–220*).—This contribution deals with the anatomy and histology of the tracheal system, its development, the supply of air to the tracheal endings, control of respiratory movements, elimination of carbon dioxide, respiration of aquatic insects, respiration of parasites, and the respiratory function of the blood. An eight-page list of references to the literature is included.

Contribution to the study of immunity in insects [trans. title], V. CHORINE (*Bul. Biol. France et Belg., 65 (1931), No. 3, pp. 291–393, figs. 3*).—The subject is considered under the headings of material and methods used in the course of the investigation, natural immunity of insects, acquired immunity to microbes affecting insects, the mechanism of immunity to microbes affecting insects, and acquired immunity against soluble substances. A bibliography of five pages is included.

Classification of insects, C. T. BRUES and A. L. MELANDER (*Bul. Mus. Compar. Zool., 73 (1932), pp. 672, figs. 1122*).—This manual, of which the precursor, entitled Key to the Families of North American Insects, was published in 1915 (E. S. R., 33, p. 652), deals in part 1 with the Insecta (pp. 17–528) and part 2 with other terrestrial Arthropoda (pp. 529–604). Part 3 consists of a glossary (pp. 605–616) and an index.

[Reports and contributions on economic insects and insect control] (*Ariz. Comn. Agr. and Hort. Ann. Rpts., 17–18 (1926–1927), pp. 15–36, 61–63, figs. 4; 19–20 (1928–1929), pp. 14–31, 52–58, 59, 60, fig. 1; 21–22 (1930–1931), pp. 32–64, 89–98, pl. 1, figs. 3*).—In addition to routine work, these reports include the date palm inspection from 1925 to 1930, compiled by H. B. Skinner; insect pests prevalent during 1925–1928, compiled by J. H. O'Dell, and 1929–1930, by C. D. Lebert; the grasshopper poisoning campaign; the cottony cushion scale and the Vedalia beetle in Arizona; the Thurberia boll weevil; the pink bollworm situation, 1927–1930; apiary inspection for 1929 and 1930; and a brief history of the introduction of Parlatoria [date] scale in Arizona.

[Contributions on economic insects and insect control] (*Calif. Dept. Agr. Mo. Bul., 20 (1931), No. 10–11, pp. 599–612, figs. 5; 613–626, figs. 13; 633–643, figs. 5; 655–660; 669–672; 682–690, figs. 8; 691–697, figs. 2*).—The contributions relating to economic insects here presented are as follows: The Citrus White Fly in California, by D. B. Mackie; Notes on Some California Lepidoptera of Economic Interest, by H. H. Keifer; *Oecanthus niveus* (De Geer) in Some California Fruits, by A. C. Browne; An Economic Survey of the Navel Orange Worm (*Myelois venipars* Dyar) in Arizona, by S. Lockwood; Method for Determination of the Efficiency of Sprays and HCN Gas Used in the Control of Red Scale, by W. Eberling; Effectiveness of Certain Materials in Producing Mortality of the Walnut Husk Fly *Rhagoletis completa* Cress., by A. M. Boyce; and California Psyllids of Present and Potential Economic Importance, by F. D. Klyver.

[Reports on economic insects] (*Peninsula Hort. Soc. [Del.] Trans., 45 (1931), pp. 73–80, 89–98, 105–108, 117–137*).—The contributions presented at the meeting held at Salisbury, Md., in December, 1931, include the following: Some Important Truck Crop Pests, by G. S. Langford (pp. 73–80); The Arsenic Spray Residue Problem, by W. R. M. Wharton (pp. 89–98); Parasitism and Over Winter Control on Peach Moth, by H. S. McConnell (pp. 105–108); Codling Moth Control in Delaware during 1931, with Special Reference to the Efficiency of Supplementary Control Measures, by L. A. Stearns (pp. 117–125); Codling

Moth Studies, by E. N. Cory (pp. 127–133); and The Status of Codling Moth Control in Virginia, by W. S. Hough (pp. 135–137).

[Report of work in entomology] (*Iowa Sta. Rpt. 1931, pp. 59–62*).—Progress during the year in entomology (E. S. R., 65, p. 153) is briefly noted under the headings of time and labor factors involved in gathering, ripening, and storing of honey by honeybees, by O. W. Park; bionomics and control of the apple maggot, nutrition and metabolism of certain insects (largely insects attacking grain and foods), and insecticides and insect toxicology, by C. H. Richardson; wheat insect pest survey and onion insects, by Drake; and cornstalk borers, by C. J. Decker (E. S. R., 66, p. 157).

[Report of work with economic insects and their control], A. I. Bourne et al. (*Massachusetts Sta. Bul. 280 (1932), pp. 213–220, 228*).—This report (E. S. R., 65, p. 353) includes an account of materials which promise value in insect control, of the control of onion thrips, of the spray residue problem, of a systematic study of oil sprays, and of apple maggot control, all by Bourne, and of control of the plum curculio in apples, of the biology and control of the carrot rust fly, and of naphthalene and similar materials as fumigants for the control of greenhouse insect pests, all by W. D. Whitcomb at Waltham. Brief reference to oil sprays is made by E. B. Holland.

[Work in entomology in Missouri] (*Missouri Sta. Bul. 310 (1932), pp. 30–33, 42*).—The progress results are noted of grasshopper studies, codling moth abundance, and chinch bug control, by L. Haseman; Hessian fly-resistant qualities of different varieties of wheat, strawberry insects, and control of the codling moth, all by Haseman and P. H. Johnson; insect pests of the melon, by Haseman and P. B. McCall; and summer oils for codling moth control, by H. G. Swartwout.

[Contributions on economic insects in New Jersey] (*N. J. State Hort. Soc. Proc., 1931, pp. 43–58, 153–163*).—The proceedings of the annual meeting (E. S. R., 65, p. 651), held at Atlantic City, N. J., in December, 1931, include Fruit Insects in 1931 with Special Reference to Codling Moth and Aphis, by T. J. Headlee, and Important Vegetable Insects of 1931 and Suggested Control Measures for 1932, by R. C. Burdette.

[Contributions on economic insects in New York] (*N. Y. State Dept. Agr. and Markets, Agr. Bul. 240 (1930), pp. 58–83, figs. 26*).—Some Insects Injurious to Vegetables (pp. 58–69), dealt with by G. W. Herrick, is followed by an account of The Carrot Rust Fly Problem in New York (pp. 70–75), by H. Glasgow and J. G. Gaines, and of the Onion Maggot Control in New York (pp. 76–83), by H. Glasgow and H. T. Cook.

[Contributions on economic insects and their control in Ohio] (*Ohio State Hort. Soc. Proc., 62 (1929), pp. 15–26, 51–58, 194–198; 63 (1930), pp. 113–125, 155–171; 64 (1931), pp. 12–28, 29–43, figs. 6; 65 (1932), pp. 109–148, figs. 2, pp. 206–211*).—The contributions presented at these annual meetings of the society are as follows:

1929.—Natural Enemies of the Oriental Fruit Moth, by A. Peterson (pp. 15–18); The Oriental Peach Moth in Ohio during 1928, by L. A. Stearns (pp. 19–26); The Apple Flea Weevil and Curculios [Apple and Plum Curculios] Attacking Apple, by J. S. Houser (pp. 51–58); and Some Factors Concerning the Value of Bees to Fruit Growers for Pollination Purposes, by R. H. Kelty (pp. 194–198).

1930.—The Apple Maggot, by T. H. Parks (pp. 113–117); Apple Flea Weevil, Apple Leaf Hopper, and European Red Mite, by J. S. Houser (pp. 118–125); and Practical Considerations in the Control of Plant Lice in the Orchard, by V. I. Safro (p. 155–171).

1931.—Analyzing Our Codling Moth Problem, by T. H. Parks (pp. 12–18); Experimental Work with Codling Moth in Ohio, by C. R. Cutright (pp. 19–28); and Some New Phases on the Oriental Fruit Moth Situation, by R. B. Neiswander and M. A. Vogel (pp. 29–43).

1932.—Some Studies of the Cost and Quantity of Materials for Spraying, by C. W. Ellenwood (pp. 109–114); Investigations by the United States Department of Agriculture in the Control of the Oriental Fruit Moth, by B. A. Porter (pp. 115–123); Progress in Oriental Fruit Moth Control in Ohio, by R. B. Neiswander and M. A. Vogel (pp. 124–134); Present Status of Self Working Bands for Control of Codling Moth, by E. H. Siegler (pp. 135–138); Comparison of Arsenate of Lead and Summer Oil for Controlling Summer Broods of Codling Moth, by C. R. Cleveland (pp. 139–143); 1931 Results in Codling Moth Control with Summer Oils, by C. R. Cutright (pp. 144–148); and Controlling Grape Insects and the Present Situation Regarding Arsenical Residue, by G. A. Runner (pp. 206–211).

[Contributions on economic insects in Utah] (*Utah Acad. Sci. Proc., 8 (1930–1931), pp. 140–150, 153, 154, figs. 2*).—The contributions here presented relating to economic insects include the following: Notes on Insect Food of Two Utah Lizards, by G. F. Knowlton and M. J. Janes (pp 140–142); Some Economic Insects of Utah, 1931, by G. F. Knowlton (pp. 143–146); Notes on Some Beneficial Utah Diptera, by G. F. Knowlton and M. J. Janes (pp. 147, 148); Notes on the Biology of *Microbracon hebetor* (Say), by G. F. Knowlton (pp. 149, 150), all from the Utah Experiment Station; and A Preliminary List of Utah Siphonaptera, by J. S. Stanford (pp. 153, 154).

[Contributions on economic insects and their control] (*Wash. State Hort. Assoc. Proc., 26 (1930), pp. 51–53, 54–56, figs. 2, 59–71, figs. 8, 73–76, 79–84, 183–186, 199–201, 207–212; 27 (1931), pp. 13–30, 31–45, figs. 13, 46–51, fig. 1, 52–56, 57–60, fig. 1, 203–207*).—The contributions presented in December, 1930, are as follows: Use of Sprinklers in Orchard Irrigation—7, Effect on Arsenical Spray Residue, by H. C. Diehl (pp. 51–53); Effect of Overhead Sprinklers on Insects and Their Control, by A. Spuler (pp. 54–56); Value of Combinations with Lead Arsenate and Summer Oils in Codling Moth Control, by A. Spuler, T. Strand, R. Dorman, K. Gillies, and D. Brannon (pp. 59–71); Fluorine Compounds as Substitutes for Lead Arsenate in the Control of the Codling Moth, by E. J. Newcomer and R. H. Carter (pp. 73–76); The Tarnished Plant Bug, by M. A. Yothers (pp. 79–84); Holly Insects, by W. S. Baker (pp. 183, 184); The Use of Dormant Oil Emulsion Spray for Lecanium Scale, by H. N. Leckenby (pp. 185, 186); The Redberry Disease of Blackberries [*Eriophyes essigi* Hass.], by A. J. Hanson (pp. 199–201); and Insect Pests of Sour Cherries, by W. S. Baker (pp. 207–212).

The contributions of December, 1931, are as follows: The Tarnished Plant Bug, by A. R. Rolfs (pp. 13–16); Red Spider Control, by R. L. Webster (pp. 17–21); Some Factors Influencing Spray Injury on Apples, by F. L. Overley and E. L. Overholser (pp. 23–30); Factors Influencing the Cost of Codling Moth Control, by A. Spuler, R. Dorman, and K. Gillies (pp. 31–45); A Codling Moth Control Schedule for 1932, by E. J. Newcomer (pp. 46–51); Compatibility of Acid Lead Arsenate with Commercial Oil Emulsions as Used in the Pacific Northwest, by C. W. Murray (pp. 52–56); The Effect of Fish and Mineral Oil Sprays in Problems of Arsenical Spray Residue Removal, by H. C. Diehl and J. E. Fahey (pp. 57–60); and Redberry Mite [*Eriophyes essigi* Hass.] of the Blackberry, by D. C. Mote and J. Wilcox (pp. 203–207).

The insect fauna of Iceland and her problems [trans. title], C. H. Lindroth (*Zool. Bidr. Uppsala, 13 (1931), pp. 105–599, figs. 56*).—In this work, also

issued separately as an inaugural dissertation, the author reports upon 700 insect species, representing 17 orders, found to occur in Iceland. In the general discussion (pp. 371–572), which follows the special part (pp. 112–370), the arrangement of which is by orders, the author deals with the insect fauna as related to climate, flora, man, vertical distribution, horizontal distribution, and comparative results and history. A seven-page list of references to the literature and a subject index are included.

[**Contributions on economic entomology**] (*Arb. Biol. Reichsanst. Land u. Forstw., 18 (1930), Nos. 1, pp. 101–115, figs. 2; 2, pp. 189–199, figs. 4, pp. 201–231, figs. 5; 4, pp. 385–403; 18 (1931), No. 5, pp. 583–675, figs. 11*).—The contributions here presented (E. S. R., 64, p. 853; 65, p. 551) are as follows: Comparative Investigations of Dusts and Baits in the Control of the Beet Carrion Beetle [*Blitophaga opaca* L.], by B. Rademacher (pp. 101–115); The Colorado Potato Beetle (*Leptinotarsa decemlineata* (Say)), by W. Schnauer (pp. 189–199); Investigations of the Insecticide Action of Oxides and Carbonates, by F. Zacher and G. Kunike (pp. 201–231); The Occurrence of the European Corn Borer (*Pyrausta nubilalis* Hbn.) in Baden in 1928, by G. Kunike (pp. 385–403); and The Value of Animal and Plant Distribution Information in Forest Protection—I, Presentation of *Lymantria monacha* L., *Ips typographus* L., and *Hylurgops glabratus* Zett., by S. Wilke (pp. 583–675).

6,000 illustrated insects of Japan-Empire [trans. title], S. Matsumura (*Tokyo, 1931, pp. 5+191+[1497+31]*).—This illustrated account of some 6,000 insects occurring in Japan is accompanied by an index that is arranged by orders, 24 in number (pp. 1–191).

Report on the work of the entomological division, J. C. Hutson (*Ceylon Admin. Rpts., Sect. IV, Dept. Agr., 1930, pp. D70–D77*).—A brief report is given on work under way, including major work relating to termites and minor investigations relating to the red weevil of coconuts (*Rhynchophorus ferrugineus*) and pests of vegetable and food crops, including the bean fly *Agromyza phaseoli*, a caterpillar pest of jack (*Artocarpus integrifolia*), and a new weevil pest of kapok (*Eriodendron anfractuosum*).

Insects during 1930, G. H. Corbett (*Straits Settlements and Fed. Malay States Dept. Agr., Gen. Ser. No. 6 (1931), pp. 52–64*).—Notes are given on the occurrence of and work with economic pests in the Straits Settlements and Federated Malay States during 1930.

Annual report of the senior entomologist, 1930, T. J. Anderson (*Kenya Colony Dept. Agr. Ann. Rpt. 1930, pp. 190–205*).—This is a report on the work of the year (E. S. R., 64, p. 749), including the occurrence of and control work with insect pests of coffee and maize.

Entomology memoirs.—Memoir No. 7 (*Union So. Africa Dept. Agr., Ent. Mem. 7 (1931), pp. 81, figs. 10*).—This seventh memoir (E. S. R., 64, p. 359) consists of the following contributions: *Aphis leguminosae*, A Biological Study, by C. P. van der Merwe (pp. 5–16), and Non-arsenical Fruit-Fly [*Pterandrus rosa* (Ksh.)] Poisons (pp. 17–23) and Further Studies on the Olfactory Reactions of the Natal Fruit-Fly, *Pterandrus rosa* (Ksh.) (pp. 24–81), both by L. B. Ripley and G. A. Hepburn.

Sodium fluosilicate was found by Ripley and Hepburn (pp. 17–23) to be promising as a fruit fly poison for use in sweetened bait on citrus foliage, having a toxicity to the Natal fruit fly (*P. rosa*) 16 times that of lead arsenate. "It could be employed far more cheaply than the latter poison. Although preliminary trials showed no damage to citrus foliage at concentrations sufficiently high to insure adequate toxicity to the fly, further investigation is required to determine the effect upon the foliage and upon the flavor of the

fruit. Barium fluosilicate and lead arsenate appear to be about equally toxic to the fly. Owing to its lower toxicity to foliage than that of the sodium salt, the former deserves further study, especially as an insecticide to be used against false codling moth and leaf-eating insects attacking citrus, where heavy spraying may be required. Cryolite, calcium fluosilicate, copper carbonate, and Pulvex (a Derris product) are not sufficiently toxic to be useful as Natal fruit fly poisons. Derrisol is highly toxic but somewhat too volatile for use in foliage baits."

These authors describe new methods of studying the olfactory reactions of fruit flies (pp. 24–81). "Some 350 pure compounds, essential oils, and other substances have been tested for their olfactory effect upon *P. rosa* (Ksh.), and the results are presented in the form of an incomplete table. The tested substances are classified as attractants, repellents, and obscurants, and in many cases the intensity of the reaction caused has been numerically expressed. Of 86 attractants found, only 32 are strong enough to attract in the orchard. Nine of these affect males only, most of the others attracting the sexes about equally. Pollard bait is the strongest attractant known of those that attract both sexes. By its use in traps infestation can be materially reduced, but satisfactory control is not achieved, a stronger attractant being required. The principal attractive compounds in it (liberated as fermentation products) have thus far eluded detection."

Coleoptera and Diptera collected from a New Jersey sheep pasture, J. W. Wilson (*Jour. N. Y. Ent. Soc., 40 (1932), No. 1, pp. 77–93*).—A list is given of 43 species of Coleoptera belonging to 7 families and 62 species of Diptera belonging to 22 families collected from a sheep pasture, mostly about dung, near Princeton, N. J., during the summer of 1928.

Insects injurious to alfalfa, S. B. Doten (*Nevada Sta. Rpt. 1931, p. 14*).—This is a brief note of work in 1930 with the alfalfa weevil.

[Contributions on fruit insects and their control] (*Mass. Fruit Growers' Assoc. Rpt., 37 (1931), pp. 29–34, 36–44, 46–53, 64, 66–71, 76–87*).—The contributions presented at the annual meeting of the Massachusetts Fruit Growers' Association held in January, 1931, include the following: Apple Maggot Studies in New York State, by P. J. Chapman (pp. 29–34, 36–41); Some Observations on the State Apple Maggot Survey of 1930, by W. E. Piper (pp. 42–44, 46–48); Will Recommended Control Measures for Apple Maggot Work in Massachusetts? by A. I. Bourne and W. H. Thies (pp. 49–53); A Test of Certain Spray Materials, by O. C. Roberts and A. I. Bourne (pp. 64, 66–71); The Curculio and the Weather, by W. D. Whitcomb (pp. 76–80); and Holes in Our Spray Program, by F. E. Cole (pp. 81–87).

[Contributions on fruit insects and their control] (*N. Y. State Hort. Soc. Proc., 76 (1931), pp. 8–22, 22–31, 37–50, figs. 3, pp. 51–54, 189–197, 201–210*).—Practical accounts presented at the annual meeting of the association held in January, 1931, include the following: The Oriental Peach Moth, by D. M. Daniel (pp. 8–10); Injurious Insects in 1930, by R. D. Glasgow (pp. 10–19); Summary of Insect Conditions in 1930, by C. R. Crosby (pp. 19–22); Old Spray Problems from New Angles, by P. J. Parrott (pp. 22–31); Some Experiences in the Use of Bees for Pollination, by E. F. Phillips (pp. 37–50); Studies on Spray Residue, by L. H. Streeter (pp. 51–54); The Pear Midge, by F. Z. Hartzell (pp. 189–197); and The Apple Maggot, by P. J. Chapman (pp. 201–210).

New fruit insects in Utah, H. J. Pack (*Utah Acad. Sci. Proc., 7 (1929–1930), p. 59*).—The eye-spotted bud moth, lesser bud moth, fall cankerworm, and cigar case bearer have recently been discovered to occur in Utah.

Injurious and beneficial insects affecting the cranberry, H. J. FRANKLIN (*Massachusetts Sta. Bul. 280 (1932), p. 208*).—Brief reference is made to work with several of the more important cranberry insects (E. S. R., 65, p. 356), including the black-headed fireworm, false blossom leafhopper (*Ophiola striatula*), red striped fireworm (*Gelechia trialbamaculella*), cranberry girdler, and the cranberry fruit worm.

Two destructive insects of carnation plants (Epichorista ionephela Meyr. and Chloridea obsoleta), D. GUNN (*Union So. Africa Dept. Agr. Bul. 94 (1931), pp. 9, figs. 5*).—A practical summary of information on the carnation worm *E. ionephela* and the bollworm.

Virus diseases of plants and their relationship with insect vectors, K. M. SMITH (*Biol. Rev. and Biol. Proc. Cambridge Phil. Soc., 6 (1931), No. 3, pp. 302–344*).—Following a brief historical reference, a brief survey (pp. 303–315) is made of all the plant virus diseases so far described, which are classified according to their plant hosts and, where known, the insect vectors of each virus are given. An analysis is given (pp. 315–318) of the various insect groups concerned in the dissemination of plant viruses, and the numerical relationship of each group to virus dissemination is shown. The insects are broadly divided into two groups according to their method of feeding, i. e., biting or sucking. Biting insects (Coleoptera and Orthoptera) are shown to be incriminated with two or three plant viruses only. All the rest of the plant viruses known are disseminated by sucking insects, the numerical relationships being as follows: Thysanoptera, 1 authentic case only; Hemiptera-Heteroptera, Tingidae, 1 case; Capsidae, 3 cases; Hemiptera-Homoptera, Jassidae, and Fulgoridae, 7 cases; Coccidae, 2 or 3 cases, most of which need confirmation; Aleyrodidae, 1 case only; and Aphididae, 27 cases. The aphids are thus found to play by far the largest part in plant virus transmission, and 1 of these insects, namely, the green peach aphid, which is associated with 14 viruses, is outstanding in its apparent affinity for plant viruses.

A number of factors in the relationship between virus and insect vector were examined (pp. 318–327), as were also some factors in the relationship between the plant and the insect vector (pp. 327–332). The evidence bearing on a possible obligate relationship between virus and insect vector is reviewed. A bibliography on plant viruses and insect vectors consisting of 235 titles is included, as is an appendix containing abstracts of papers received after the manuscript had gone to press and 12 additional references.

Household insects and their control (with a chapter on animal pests other than insects), A. GIBSON and C. R. TWINN (*Canada Dept. Agr. Bul. 112, n. ser., rev. (1931), pp. 87, figs. 96*).—A revision of this summary of information (E. S. R., 62, p. 355).

Hydrocyanic acid gas as a fumigant for destroying household insects, E. A. BACK and R. T. COTTON (*U. S. Dept. Agr., Farmers' Bul. 1670 (1932), pp. II+21, figs. 20*).—This is a revision of and supersedes Farmers' Bulletin 699, previously noted (E. S. R., 34, p. 854).

Relative toxicity of some fluorine and arsenical insecticides, H. F. SMYTH and H. F. SMYTH, JR. (*Indus. and Engin. Chem., 24 (1932), No. 2, pp. 229–232, fig. 1*).—In the work here reported the authors determined the relative toxicity of fluorine and arsenical insecticides by feeding to white rats various accurately measured amounts of cryolite, barium fluosilicate, and lead arsenate mixed with their food for 16 weeks. The results obtained over the period of these tests indicate that several times as much fluorine compound is needed as arsenical compound to give the same chronic toxic effect from repeated doses. It is concluded that the use of fluorine insecticides would leave a much wider

margin of safety than do arsenical materials between the weight of spray residue on fruit and the amount toxic to the consumer.

Sodium soaps of the normal saturated fatty acids (Studies of contact insecticides, IV), W. C. O'Kane and W. A. Westgate (*New Hampshire Sta. Tech. Bul. 48 (1932), pp. 4, figs. 2*).—*In a continuation of the study of contact* insecticides (E. S. R., 65, p. 846), sodium soaps of the normal saturated fatty acids have been studied and the contact angles of successive concentrations have been determined both on paraffin-coated slides and on the integument of the larva of the yellow meal worm. These experiments were performed, in part, in order to gain further light on the relation of contact performance to adsorption phenomena. A table summarizes the contact angles photographed and measured, and from this table two graphs have been prepared which show the trend of performance of successive concentrations of the soaps studied.

***A simple device for fumigating woodwork of buildings with carbon* bisulphide**, L. B. Uichanco (*Philippine Agr., 20 (1932), No. 9, pp. 593–595*).—A description is given of an apparatus that the author has devised.

An ecological study of the "lucerne flea" (Smynthurus viridis Linn.), I, D. S. Maclagan (*Bul. Ent. Research, 23 (1932), No. 1, pp. 101–145, figs. 13*).—This is a report of a study of a springtail which damages alfalfa by skeletonizing the leaf surface through chiseling and partly eating leaves, soiling them with excrement and rendering them distasteful to stock.

The Orthoptera of Kansas, M. Hebard (*Acad. Nat. Sci. Phila. Proc., 83 (1931), pp. 119–227, figs. 3*).—*In this report on the Orthoptera the author recog*nizes 197 species, 12 subspecies, and 1 migratory phase, representing 89 genera, as occurring in Kansas. In an appended list (pp. 220–227) the author includes all the species which he has studied and reported upon as occurring in Kansas, South Dakota, Colorado, Montana, and Alberta.

Studies in Utah Orthoptera, V. M. Tanner and O. W. Olsen (*Utah Acad. Sci. Proc., 6 (1928–1929), pp. 30, 31*).—The authors record the occurrence of 111 species representing 52 genera and 8 families in Utah.

On experiments in the use of poison dusts against adult Locusta migratorioides Rch. & Frm. in the Sudan, H. H. King and W. Ruttledge (*Bul. Ent. Research, 23 (1932), No. 1, pp. 65–68*).—It is pointed out that the standard method in the Sudan of dealing with the desert locust *Schistocerca gregaria* Forsk. consists in killing the grasshoppers by means of poisoned bran baits, 1,100 tons of bait having been prepared in the campaign of 1930, the use of 660 tons of which resulted in the estimated destruction of upwards of 10,000 tons of grasshoppers. When employed against *L. migratorioides* the bait proved effective, although greater care has to be exercised in using it. Since the control of this latter species throughout its range by use of poisoned bran bait alone appeared unlikely to prove practicable, work was conducted in the laboratory with a poison dust which might be applied by airplane against the swarms in flight.

A study of the results obtained in initial experiments indicated that arsenic was not absorbed through the integument. The possibility of dust being inhaled was then investigated. The results obtained in experiments conducted in the laboratory led to the conclusion that if an adult locust (*L. migratorioides*) flies in an atmosphere charged with minute floating particles of sodium arsenite, some of the particles will reach the tracheae by way of the spiracles, and that if a sufficient quantity reaches the tracheae the result is paralysis followed by death. The authors' experience is said to indicate that a cloud of sodium arsenite dust of a fineness permitting it to pass through a standard 240 sieve behaves as does a cloud of smoke—it floats with the air currents, with

a general tendency when used in the morning when the sun has warmed the ground to rise and dissipate. It is considered unlikely that when a cloud of such dust is discharged from an airplane it will settle in sufficient concentration to be a source of danger to man or the higher animals.

Report on the 1931 locust invasion of Kenya, D. L. BLUNT ET AL. (*Kenya Colony Dept. Agr. Bul. 21 (1931), pp. 45*).—This is a report of the occurrence of and control work with *Locusta migratoria migratorioides* in Kenya Colony from January 1 to August 31. Work conducted is reported in several appendixes, namely, The Bionomics of *L. migratorioides* as Observed during the Past Campaign, by H. Wilkinson (pp. 21–35); Report on Experiments in the Dissemination of Fungus Disease (*Empusa grylli*), by C. A. Thorold (pp. 36–38); Report on Trials of Various Anti-hopper Devices and Materials, by F. B. Notley (pp. 39–43); and Observations on the Attacks by *L. migratorioides* on Species of Grasses, by D. C. Edwards (pp. 44, 45).

The occurrence of the migratory locust (Locusta migratoria migratorioides) in the Gold Coast and its dependencies during 1930, G. S. COTTERELL (*Gold Coast Dept. Agr. Bul. 23 (1930), pp. 255–281, pls. 6, fig. 1*).—This account is in continuation of that of the late W. Cook, entomologist (E. S. R., 65, p. 246).

Recommendations for the control of gladiolus thrips, A. G. DUSTAN and P. I. BRYCE (In *The 1932 Canadian Gladiolus Annual. Canad. Gladiolus Soc., 1932, pp. 61–64, fig. 1*).—Experimental work with the gladiolus thrips conducted in Ontario led the authors to recommend that the tops be cut low and the corms removed immediately from the bed for drying, that the corms be stored in a cellar at a temperature as low as possible with safety, that all tops be burned as soon as cut and the soil plowed in late autumn, that corms be fumigated in the spring with ethylene dichloride-carbon tetrachloride, and that the plants be sprayed in the early summer, as soon as the thrips appear, with a Paris green-brown sugar-water mixture, the application being at weekly intervals.

Fumigating with ethylene dichloride-carbon tetrachloride: Methods and precautions, S. D. COLLINS (In *The 1932 Canadian Gladiolus Annual. Canad. Gladiolus Soc., 1932, pp. 65, 66*).—The methods and precautions to be employed in the use of this insecticide in controlling the gladiolus thrips, as recommended by Dustan and Bryce, above noted, are dealt with.

[Spotted wilt of tomatoes: Experiments with the insect vector Frankliniella insularis], J. G. BALD and G. SAMUEL (*Aust. Council Sci. and Indus. Research Bul. 54 (1931), pp. 11–14, figs. 2*).—In further studies of the relation of the thrips *F. insularis* to the transmission of spotted wilt of tomatoes (E. S. R., 64, p. 359), the authors find the evidence to point very strongly to the conclusion that in order to be effectively transmitted by the adult a diseased plant must be fed upon by the larval stage of such thrips. In an experiment carried on for 24 days, neither the control thrips nor the thrips fed as adults on a diseased plant infected any of the plants. On the other hand, all the thrips fed as larvae on a diseased plant caused infections, some more than others. In a study of the incubation period of the virus in the insect, 5 to 6 days was the shortest and 8 to 9 the longest period observed and were in larvae. A group of larvae infected the plants on which they were placed on the eighth and ninth day after feeding on the diseased plant; they then pupated and later infected the plant on which they were placed as adults.

Thysanoptera from China, J. B. STEINWEDEN and D. MOULTON (*Fukien Christian Univ., Nat. Hist. Soc. Proc., 3 (1930), pp. 19–30*).—The authors report upon the identification of a collection of thrips from China represented by 22

species, 4 of which are described as new. This is said to be the first collection of Thysanoptera from China, only *Gnaikothrips uzeli* Zimm. having previously been recorded from that country.

Experimental studies on Chagas' disease in Panama, H. C. CLARK and L. H. DUNN (*Amer. Jour. Trop. Med., 12 (1932), No. 1, pp. 49–77*).—An account of Chagas' disease, or human trypanosomiasis, due to *Trypanosoma cruzi* Chag., recently discovered to occur in Panama. The reduviid bug *Triatoma geniculata* Latr. is believed to be the principal invertebrate host of *T. cruzi* in Panama.

Notes on control of the litchi stink bug, *Tessaratoma papillosa* Drur. (Heteroptera, Pentatomidae), K. S. CHAN (*Lingnan Sci. Jour., 10 (1931), No. 4, pp. 399–411*).—An account of control work with *T. papillosa*, particularly with the collection of adult bugs during their hibernating period and of eggs in the spring and summer and the destruction of nymphs by beating and starvation.

Lygus simonyi Reut. (Hem. Capsid.), a pest of coffee in Kenya Colony, R. H. LE PELLEY (*Bul. Ent. Research, 23 (1932), No. 1, pp. 85–89, pl. 1, figs. 2*).—The capsid *L. simonyi* has been shown by experiments to be capable of causing a serious form of coffee flower abortion in Kenya colony. Notes are presented on its biology, economic importance, natural enemies, and control measures.

An experimental and observational study of the chinch bug in relation to climate and weather, V. E. SHELFORD (*Ill. Nat. Hist. Survey Bul., 19 (1932), Art. 6, pp. III+487–547, figs. 37*).—A brief introduction is followed by an account of the length of instars and the life history of the chinch bug (pp. 489–515), cultures (pp. 515–531), and abundance in nature (pp. 531–545). A list is given of 27 references to the literature.

The biology of Erythroneura (Zygina) pallidifrons Edwards, E. I. MACGILL (*Bul. Ent. Research, 23 (1932), No. 1, pp. 33–43, figs. 6*).—This is a report of biological studies of a leafhopper which, with the nearly related *E. parvula*, has been reported with increasing frequency as a pest of greenhouse plants. These leafhoppers are widely distributed in Great Britain, having a very large range of food plants. *E. pallidifrons* will feed on chrysanthemum, Gossypium, fuchsia, geranium, Nicotiana, primula, and salvia, while, in addition to the above plants, *E. parvula* has been recorded from *Asparagus sprengeri*, calceolaria, lemon-scented verbena, salpiglossis, and tomato. The injury to the plant appears to be similar in every case, the leaves becoming covered with bleached patches caused by the removal of the chlorophyll by the insect. Thus far, a single parasite, a mymarid, which attacks the egg of *E. pallidifrons*, has been found.

Studies on the beet leafhopper, G. F. KNOWLTON (*Utah Acad. Sci. Proc., 7 (1929–1930), pp. 57, 58*).—In studies of curly-top resistance in sugar beets, in which more than 4,000 beets were inoculated and then reinoculated a few days later, 94 per cent showed positive symptoms of curly top and 84 per cent of these severe symptoms. In a study of the flora of permanent breeding grounds in northern Utah, that is, those which furnish favorable conditions for overwintering and a host plant succession capable of supporting the leafhoppers throughout the entire period of their activity, nine plants were among the most important, namely, tumble mustard, tansy mustard, blistercress, red scale, wedge scale, Russian thistle, Rocky Mountain bee plant, wild tomato, and verbena. A list is given of localities in northern Utah from which the beet leafhopper was collected in 1929.

The beet leafhopper in Utah, G. F. KNOWLTON (*Utah Acad. Sci. Proc., 6 (1928–1929), p. 8*).—A brief account of this pest more recently noted (E. S. R., 66, p. 155).

Insects as vectors of yellow dwarf of onions, C. J. Drake, H. M. Harris, and H. D. Tate (*Science, 75 (1932), No. 1943, pp. 341, 342*).—In studies at the Iowa Experiment Station of so-called "yellow dwarf" of onions, which during the season of 1928 caused losses in some plantings in the Pleasant Valley onion district of Iowa running as high as 95 per cent of the crop, the affection was found to have been transmitted to a large number of onion plants by three species of aphids, namely, the bean aphid, the corn leaf aphid, and the apple grain aphid, and by the six-spotted leafhopper. Observations indicate that the bean and the corn leaf aphids are responsible for a large percentage of the transmission of the disease.

The control of the citrophilus mealybug, Pseudococcus gahani, by Australian parasites, H. Compere and H. S. Smith (*Hilgardia [California Sta.], 6 (1932), No. 17, pp. 585–618, figs. 7*).—This account of the control of the citrophilus mealybug by parasites introduced from Australia, information on which parasites has been noted (E. S. R., 64, p. 245; 66, p. 451), takes up the subject under the headings of the search for the native home of *P. gahani*, description and biology of *Coccophagus gurneyi*, description and biology of *Tetracnemus pretiosus*, habits of *Anusoidea comperei*, habits of *Midas pygmaeus*, description and biology of *Diplosis* sp., *Chrysopa ramburi* as an enemy of *P. gahani*, biological interrelations of host and parasites, numerical relations, and economic effect of introduced parasites.

The life history and environmental relations of Trialeurodes vaporariorum (Westwood) (Homoptera-Aleurodina).—A first contribution to a monograph of this species [trans. title], H. Weber (*Ztschr. Wiss. Biol., Abt. A, Ztschr. Morph. u. Ökol. Tiere, 23 (1931), No. 3–4, pp. 575–753, figs. 59*).—This account of the greenhouse white fly is accompanied by a list of 94 references to the literature.

Some Formosan whiteflies, R. Takahashi (*Jour. Soc. Trop. Agr. (Nettai Nôgaku Kwaishi), 3 (1931), No. 3, pp. 218–224, figs. 5; Japan. abs., p. 224*).—Two species of Dialeurodes and one of Bemisia met with in Taiwan (Formosa) are described as new, and the genera Acanthaleyrodes and Setaleyrodes are erected.

Control of Latania scale (Aspidiotus lataniae Sign), H. J. Quayle (*Calif. Avocado Assoc. Yearbook, 1931, pp. 97–100, figs. 4*).—This is a contribution from the California Citrus Experiment Station on the most important scale insect attacking the avocado in California. Spraying work for the control of *A. lataniae* has thus far been unsatisfactory, the sprays having caused more or less injury to the tree. It was found possible to effect a very high degree of control by fumigation with hydrocyanic acid gas, without injury to the tree, when the fumigation work is carried on at the proper season.

***Coccoids* collected on wild plants in semi-arid regions of Texas and Mexico (Homoptera),** F. F. Bibby (*Bul. Brooklyn Ent. Soc., 26 (1931), No. 4, pp. 189–194; also in Jour. N. Y. Ent. Soc., 39 (1931), No. 4, pp. 587–591*).—This is a classified list of Coccoidea collected on wild plants in semiarid regions of Texas and Mexico, mostly, however, in Hidalgo County of the lower Rio Grande Valley of Texas, contributed from the Texas Experiment Station.

The butterflies of the District of Columbia and vicinity, A. H. Clark (*U. S. Natl. Mus. Bul. 157 (1932), pp. IX+337, pls. 64*).—This account, based primarily upon personal investigations, reveals a total of 85 species in the District of Columbia and immediately adjacent territory. In an introductory discussion the author deals with collateral studies, material studied, importations from the Tropics, forms of District butterflies, nomenclature, faunal relations of the District of Columbia, relative occurrence and habitats, general

features of the District fauna, the occurrence of butterflies in the District, the succession of butterflies, the end of the season, pressure of population, butterflies and storms, extirpation of one butterfly by another, and observations on butterfly migrations, and gives suggestions for studying butterflies. A key is given to the superfamilies of butterflies. The species, in systematic order, are then considered, including their occurrence, habits, seasons, spring forms, etc. A tabulation of the seasonal occurrence of local butterflies, odors of District butterflies, and emanations from butterflies' wings are then considered. An appendix deals with butterflies of probable or possible occurrence in the District.

The changes which occur in the body of the larvae of Pieris brassicae L. infected by Entomophthora sphaerosperma Fres. [trans. title], M. Roczkowska (*Rocz. Nauk Rolnicz. i Leśnych (Polish Agr. and Forest. Ann.), 27 (1932), No. 1, pp. 137–156, pl. 1, figs. 8; Eng. abs., pp. 152, 153*).—This is a report upon the course of internal destruction caused by the fungus parasite *E. sphaerosperma* in *P. brassicae*.

[Silkworm studies] (*Research Bul. Agr. Expt. Sta. So. Manchuria Ry. Co., No. 4 (1931), pp. 37–84, pls. 3*).—The following two articles in Japanese are included: On the Sericultural Peculiarities from the Foods of Silkworms in South Manchuria, by S. Ikeda (pp. 37–54), and Studies on the Rearing of the Monovoltine Silkworm (*Bombyx mori* L.) in Summer Time in South Manchuria, by H. Yugawa (pp. 55–84).

The introduction of the eri or castor oil silk-worm into Egypt, E. W. and E. E. Adair (*Bul. Soc. Roy. Ent. Égypte, 24 (1931), No. 3–4, pp. 140–156*).—An account of the introduction of *Attacus ricini* Boisd. from India into Egypt.

Results of the eleventh year's work against the gipsy moth in New Jersey, H. B. Weiss (*N. J. Dept. Agr. Circ. 208 (1931), pp. 7, fig. 1*).—This progress report (E. S. R., 64, p. 546) includes a table giving the results of the past 11 years' work and shows that no infestations have been found in the New Jersey area during the past 2 years.

The control and economic importance of the greater coconut spike moth (Tirathaba rufivena Walk.), G. H. Corbett (*Straits Settlements and Fed. Malay States Dept. Agr., Sci. Ser. No. 8 (1931), pp. 14, pl. 1*).—Studies of *T. rufivena* here reported have shown that the removal of the sheath of the inflorescence of the coconut palm just before the spikes would normally burst is a satisfactory control measure.

Tomato worm, Protoparce sexta, E. I. McDaniel (*Michigan Sta. Quart. Bul., 14 (1932), No. 4, pp. 245, 246, figs. 2*).—A brief account is given of the tomato worm, which was unusually abundant in Michigan in the summer of 1931, attacking not only tomato but also potato and devouring the tops of both plants very freely.

Emergence cages and bait pails for timing codling moth sprays, H. N. Worthley (*Pennsylvania Sta. Bul. 277 (1932), pp. 19, figs. 8*).—The data obtained in observations of codling moth emergence cages and bait pails and the results of their use at State College, Pa., have been compared by the author in terms of spraying dates.

It was found that codling moth sprays could not be timed by means of calendar dates or comparisons with tree development, and that no set program calling for so many sprays, so many days apart, would suit the needs of all seasons and all localities in the State. It was determined that the behavior of the codling moth in a particular orchard is best revealed by means of bait-pail catches. Emergence cages, which require more time and care in operation, are useful in orchards where the moth population is low, or where it may be de-

sirable to mark the limits of the two broods of moths, or to determine the percentage of first brood larvae which pupate. The first cover spray should be finished within 10 days after the first peak of moth activity, as shown in the records, unless a recent spray for curculio has been applied. Subsequent sprays should be applied in the same manner following each peak, except where these indicate intervals of less than 10 days between spray applications. At critical times during the emergence period, heavy rains following a spray may indicate a closer spacing than 10 days. Slight moth activity occasioned by periods of low temperature may allow this interval to be lengthened.

"An appreciation of the factors involved in the timing of codling moth sprays should lead to a better understanding of control recommendations. The correct interpretation of codling moth emergence and bait-pail records, even where these are carefully taken, is not a simple matter. The setting of spray dates based on such records may need to be modified by a consideration of several other factors. Good judgment is required, in addition to a knowledge of proper methods and materials, for the application of a series of first brood codling moth sprays, if these are to obviate the necessity for second brood spraying and maintain the codling moth population at a low level."

Controlling the codling moth in southwestern Michigan, F. SHERMAN, III (*Michigan Sta. Spec. Bul. 221 (1932), pp. 30+[1], figs. 10*).—This is a progress report on a project commenced in the spring of 1929 and carried on during that year by L. G. Gentner. It has since been continued by the author, a brief account by whom has been noted (E. S. R., 66, p. 453.)

The results of experiments and observations made in the Fennville district led to the conclusion that the main reliance should be placed on lead arsenate sprays, applications of which should be carefully timed. The fact that heavy losses result when the practice of eliminating late summer sprays for the summer brood larvae is followed and that two and sometimes three late applications are necessary is emphasized. The use of oils of any kind combined with lead arsenate in sprays was found inadvisable under present conditions, since they increase the difficulty of removing the spray residue from the fruit. "Summer oil sprays have shown promise for controlling codling moth, but the uncertainty of their action on the fruit and foliage prohibit recommending their use. The oil-nicotine combination shows decided promise as a control for codling moth, but, as yet, this combination as a fully adequate substitute for lead arsenate is not recommended. The use of oil and oil-nicotine combination for the summer brood sprays does not always insure a freedom from an excess of residue. Enough residue may remain on the fruit from the early sprays to exceed the tolerance.

"Supplementary measures, other than spraying, are very important in reducing codling moth infestation in the orchard. Thorough scraping of the trees, followed by banding with chemically treated cardboard bands, is strongly urged. The scrapings, when removed from the tree, should be treated in such a manner as to kill all of the hibernating larvae. Orchard sanitation, destruction of culls, killing the larvae hibernating in packing crates, and proper management of cider mills, packing houses, and storage houses to prevent moths escaping in the spring are all important steps in reducing the codling moth population."

Codling moth control: Competitive spraying tests, A. A. HAMMOND (*Jour. Dept. Agr. Victoria, 29 (1931), No. 10, pp. 494-500, fig. 1*).—The details of control work with the codling moth in Victoria are reported in tabular form.

Notes on the gooseberry fruit worm, Zophodia grossulariae, H. J. PACK and V. DOWDLE (*Utah Acad. Sci. Proc., 7 (1929-1930), p. 59*).—A brief account

is given of the biology of the gooseberry fruit worm, the most serious insect enemy of gooseberries in the State, which also attacks wild, cultivated, and English currants. In several counties of Utah this lepidopteron destroys as high as three-fourths of the gooseberry crop.

A new pine moth from Connecticut, C. HEINRICH (*Ent. Soc. Wash. Proc., 33 (1931) No. 8, pp. 196, 197*).—Under the name *Eucosma gloriola* n. sp. the author describes a moth, the larva of which was found feeding in the tips of white pine twigs at Stamford, Conn.

Note: **A fungous disease of the coconut leaf miner (Promecotheca cumingii Baly)**, M. S. CELINO (*Philippine Agr., 19 (1930), No. 4, p. 253*).—Reference is made to an unnamed fungus isolated in pure culture from *P. cumingii*, inoculations of which resulted, after six days, in an average mortality of 58 per cent.

The campaign against the coconut leaf miner (Promecotheca cumingi Baly), 1930–1931, J. B. VARGAS (*Philippine Jour. Agr., 2 (1931), No. 3, pp. 189–207, pls. 5, fig. 1*).—This is a report upon the very unusual outbreak of *P. cumingi*, which invaded particularly the southern Tagalog Provinces, Laguna, Batangas, and Tayabas, and the extensive campaign that was carried on against it.

Laphygma exempta Walker, a new pest of rice and maize in 1930 [trans. title], P. VAN DER GOOT (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Korte Meded. Inst. Plantenziekten, No. 17 (1931), pp. 12, pl. 1; Eng. abs., pp. 10, 11*).—This is an account of the attacks of rice and corn in 1930 by *L. exempta*. The rice largely recovered, but about 30 per cent of the young corn was destroyed and had to be replanted.

Studies on the rice-borer, Chilo simplex Butler, I, II, C. HARUKAWA, R. TAKATO, and S. KUMASHIRO (*Ber. Ōhara Inst. Landw. Forsch., 5 (1931), No. 1, pp. 177–207, figs. 8; 209–220, figs. 4*).—Two papers are presented.

I. *On the prolonged emergence period of the moth in spring.*—The first part of this contribution deals with the development of hibernating larvae and their places of hibernation (pp. 177–204), and the second part with the effect of the moisture of hibernacula on the time of pupation and emergence (pp. 204–206).

II. *Effect of constant temperature upon the development of the rice-borer.*—This deals first with the effect of temperature on the pupation and emergence of hibernating rice borers (pp. 209–211), and secondly with the effect of temperature on the development of egg, larva, and pupa (pp. 212–220).

Sod webworms and their control, W. B. NOBLE (*Bul. U. S. Golf Assoc. Green Sect., 12 (1932), No. 1, pp. 14–17, figs. 5*).—The author concludes that from the standpoint of cost and effectiveness kerosene emulsion offers the most practical control for sod webworms (*Crambus* spp.) in putting greens and lawns. For those who do not wish to go to the trouble of preparing the emulsion, pyrethrum extracts offer a rather more costly but equally efficient substitute.

Ephestia elutella Hb. as affecting the Southern Rhodesian tobacco export trade, R. W. JACK (*Rhodesia Agr. Jour., 29 (1932), No. 1, pp. 32–36*).—The author reports that this pyralid moth pest of various stored products now attacks tobacco, mainly bright and medium leaf and including both Virginia and Turkish. It has developed into a serious pest of this crop in Great Britain, and is to be considerably more feared in that country than the cigarette beetle. It is said to have been recorded first as attacking tobacco in Bulgaria in 1928, subsequent records having referred only to Great Britain until 1930, when it was discovered damaging stored Virginia leaf at Richmond, Va., as

reported by Back and Reed (E. S. R., 64, p. 547). It has been found in Salisbury, Southern Rhodesia, attacking both chocolate and tobacco but has not been discovered anywhere outside Salisbury.

Four years' observations on the eye-spotted budmoth (Spilonota ocellana D. & S.) in Nova Scotia, F. C. Gilliatt (*Sci. Agr., 12 (1932), No. 6, pp. 357-371, figs. 14*).—In this contribution the author presents unrecorded notes on the life history and habits of the eye-spotted budmoth, particularly as applying to Nova Scotia. Data on the emergence of adults in 1926, 1927, and 1928; oviposition and number of eggs laid in 1926; incubation period of eggs in 1926; emergence of the larvae, 1926–1929; hibernation of larvae, 1926–1929; width of head capsules of larval instars; percentage of infestation of blossom and leaf buds in 1926; pupation, 1926–1929; winter mortality of larvae, 1927–1930; and percentage of eggs parasitized, 1927 and 1928, are given in tabular form.

Some factors associated with the breeding of Anopheles mosquitoes, G. H. Bradley (*Jour. Agr. Research [U. S.], 44 (1932), No. 5, pp. 381–399, figs. 6*).—This contribution summarizes the results of two seasons' observations at Mound, in the northeastern part of Louisiana in what is known as the Louisiana Delta region, made on various environmental factors prevailing in Anopheles breeding and nonbreeding areas in order to determine if possible the factors which influence the increase or decrease of larval abundance. The subject is dealt with under the headings of methods of observation; influence of temperature, precipitation, and quantity of surface water upon Anopheles larval abundance rates and plankton content of the water; comparison of larval rates and plankton counts; rate of occurrence of the four commonest plankton genera in Anopheles breeding and nonbreeding waters; effect of impounding water on Anopheles breeding; discussion of factors in larval protection; adaptability of larvae; plants as culicides; effect of débris and of algae and other plants on larval abundance rates and plankton content of water; effect of Cyanophyceae on larval abundance; effect of Lemna on larval abundance; hydrogen-ion concentration of water in relation to presence of Anopheles larvae; and results of larval dissection studies.

It was found that Lemna affords some protection to the larvae, but that when it occurs in such profusion as to form a complete mat over the water surface it almost completely inhibits the breeding of Anopheles. Larval abundance, as measured by the number of larvae occurring in collections of 10 dips of surface water, was not greatly affected by variations in the mean summer air temperatures, which in each month were above 70° F. Under certain conditions a rapid decrease in surface water was found to reduce the number of larvae, as a result of the stranding of protective material. It was found that as a rule larger numbers of plankton organisms occurred in the nonbreeding waters. This was explained in part by the fact that the breeding waters usually are more shaded and the surface is covered to a greater extent by vegetation and débris, and this condition results in the development of fewer chlorophyll-bearing organisms. The range of hydrogen-ion concentration in the breeding and nonbreeding waters was found to be essentially the same, and all groups of waters were principally alkaline in reaction.

Further incrimination of Anopheles darlingi Root as a transmitter of malaria, N. C. Davis and H. H. W. Kumm (*Amer. Jour. Trop. Med., 12 (1932), No. 1, pp. 93–95*).—The authors report having found *A. darlingi* to be transmitting malaria in França, Brazil.

Mosquitoes transported by airplanes: Staining method used in determining their importation, T. H. D. and J. J. Griffitts (*Pub. Health Rpts.*

[U. S.], 46 (1931), No. 47, pp. 2775–2782, pls. 2).—In inspections made of airplanes from tropical ports arriving at airports at Miami, with a view to determining the importance of such transportation, it was found that certain types of machines carry mosquitoes, particularly the yellow fever mosquito and *Culex quinquefasciatus*. With conditions at airports such as would permit of many mosquitoes getting aboard, it is thought that approximately one-fifth of the original number would be transported for a long distance—at least 1,250 miles—in one day, with repeated landing and the opening of doors, hatches, and windows, and refueling, unloading, and loading taking place. The staining method used in the work of determining their importation is described.

Anopheles atropos D. & K., a new potential carrier of malaria organisms, B. MAYNE and T. H. D. GRIFFITTS (*Pub. Health Rpts.* [*U. S.*], *46* (*1931*), *No. 52, pp. 3107–3115, pl. 1*).—The authors have proved in infectivity tests that *A. atropos* is equally as efficient a carrier of *Plasmodium vivax* as are *A. quadrimaculatus*, *A. crucians*, and *A. punctipennis* used as controls under similar or more favorable conditions.

Illustrated keys to the full-grown larvae and adults of South African anopheline mosquitoes, B. DE MEILLON (*So. African Inst. Med. Research Pubs., No. 28* (*1931*), *pp. 275–375, figs. 200*).—The illustrated keys here presented are accompanied by additional information on methods, etc.

A practicum of cecidiology, H. ROSS (*Praktikum der Gallenkunde* (*Cecidologie*). *Berlin: Julius Springer, 1932, pp. X+312, figs. 181*).—This is a handbook on galls and gall formations and structure, in which a seven-page list of the literature is included.

Sterilization and growth of the eggs and larvae of the blow-fly, O. R. CAUSEY (*Amer. Jour. Hyg., 15* (*1932*), *No. 1, pp. 276–286*).—The author has found that rat embryos removed aseptically by Caesarian operation and embedded in nutrient agar constitute an adequate medium for the development of sterile blowfly larvae for use in the treatment of cases of osteomyelitis. Blowfly eggs can be sterilized with a mercuric chloride-alcohol acid compound or with Merthiolate, and sterile flies produced from aseptic larvae can be maintained in an aseptic environment for at least two weeks.

A bibliography of 32 titles is included.

The frit fly problem in the northwest of England, H. W. MILES (*Jour. Roy. Lancashire Agr. Soc., 1930, pp. 7–17, figs. 9*).—In addition to the general information here presented, the author presents a summary of injury to grain in 1929. A table is given which shows the percentage of frit fly infestation in Lancashire.

The feeding habits of the first instar larvae of the cluster fly, R. M. DECOURSEY (*Science, 75* (*1932*), *No. 1941, p. 287*).—The author reports having observed the first instar larvae of the cluster fly in the laboratory feeding upon the earthworm *Allolobophora caliginosa*, entering directly through the cuticula. They were observed in various stages of entrance, from the time when only the mouth parts were imbedded in the cuticula until only the posterior spiracles were exposed. As many as five larvae were observed feeding on one earthworm.

The treatment of osteomyelitis (infection of bone) with fly larvae, D. F. MILLER, C. A. DOAN, and E. H. WILSON (*Ohio Jour. Sci., 32* (*1932*), *No. 1, pp. 1–8*).—A report of the methods employed in the rearing of two species of blowflies, *Lucilia sericata* and *Phormia regina*, for use in the treatment of osteomyelitis.

Scavenger flies found on hides, F. O'FLAHERTY and W. RODDY (*Jour. Amer. Leather Chem. Assoc., 27* (*1932*), *No. 2, pp. 36–39, pls. 2, fig. 1*).—This is an

account of the occurrence of dipterous larvae on hides, identified as (*Desmometopa*) *Prodesmometopa latipes* Meig., a cosmopolitan scavenger.

Typhus fever: The experimental transmission of endemic typhus fever of the United States by the rat flea Xenopsylla cheopis, R. E. Dyer, E. T. Ceder, R. D. Lillie, A. Rumbeich, and L. F. Badger (*Pub. Health Rpts.* [*U. S.*], *46* (*1931*), *No. 42*, *pp. 2481–2499*, *pls. 2*, *figs. 9*).—The authors have found that the oriental rat flea, as a vector of endemic typhus, meets the requirements of the epidemiological evidence. The virus of endemic typhus was recovered four times by the authors from rat fleas taken at typhus foci, and experimental transmission of the virus from rat to rat by this flea was carried out in the laboratory. The evidence points to this flea as a common vector of endemic typhus from rat to rat and from rat to man.

Rat-flea survey of the port of St. Thomas, Virgin Islands, E. H. Carnes (*Pub. Health Rpts.* [*U. S.*], *46* (*1931*), *No. 43*, *pp. 2558–2562*, *fig. 1*).—Of the 2,113 fleas taken from 312 rats from July 1, 1929, to June 30, 1930, 99.7 per cent were identified as the oriental rat flea and 0.3 per cent as the dog flea. *Rattus alexandrinus* was found to be the predominating rat, none of *R. norvegicus* being found.

Final report on a rat-flea survey of San Juan, Porto Rico, A. L. Carrión (*Pub. Health Rpts.* [*U. S.*], *47* (*1932*), *No. 4*, *pp. 193–201*, *figs. 5*).—Of the five different species of fleas collected during three consecutive years from 1,005 live rats at San Juan, of which 72 per cent were *Rattus norvegicus*, the oriental rat flea represented 98.5 per cent of the total catch.

Typhus fever: Typhus virus in feces of infected fleas (Xenopsylla cheopis) and duration of infectivity of fleas, E. T. Ceder, R. E. Dyer, A. Rumbeich, and L. F. Badger (*Pub. Health Rpts.* [*U. S.*], *46* (*1931*), *No. 52*, *pp. 3103–3106*, *figs. 2*).—The study here reported suggests that the rubbing of infected feces into wounds made by biting of the oriental rat flea or by scratching is a probable mechanism by which endemic typhus may be transmitted. Experimental work shows that the virus may remain virulent in the oriental rat flea for as long as 36 days after the last infecting feeding. It is considered probable that once this species of flea becomes infected it may remain infective through life.

Transmission of endemic typhus by rubbing either crushed infected fleas or infected flea feces into wounds, R. E. Dyer, E. T. Ceder, W. G. Workman, A. Rumbeich, and L. F. Badger (*Pub. Health Rpts.* [*U. S.*], *47* (*1932*), *No. 3*, *pp. 131–133*).—The work here reported is considered to add additional weight to the suggestion in the account above noted that the rubbing of infected flea feces into wounds made by the biting of the oriental rat flea or by scratching is a probable mechanism by which endemic typhus may be transmitted.

The life history and control of Celosterna scabrator F. (Col., Cerambycidae), C. F. C. Beeson (*Indian Forest Rec.*, *16* (*1931*), *No. 9*, *pp. 279–294*, *pls. 2*).—An account is given of a cerambycid borer which is widely distributed throughout India, where it attacks *Acacia arabica* and several other species of trees.

Red-necked cane-borer, Agrilus ruficollis, and raspberry cane-borer, Oberea bimaculata, R. Hutson (*Michigan Sta. Quart. Bul.*, *14* (*1932*), *No. 4*, *pp. 267–269*, *fig. 1*).—This is a practical account of two pests that attack raspberry canes and were the cause of much injury in the State during the last two years.

Notes on cane grubs in Batangas and Occidental Negros: Collecting beetles as a control measure, F. Q. Otanes (*Philippine Jour. Agr.*, *2* (*1931*), *No. 2*,

pp. 129–161, pls. 3, figs. 4).—This account reports upon the collection of beetles, particularly *Leucopholis irrorata*, as a control measure.

Arsenicals in potato flea beetle control, H. L. Gui (*Ohio Sta. Bimo. Bul. 156 (1932), pp. 104–111*).—Control work with the potato flea beetle during the years 1930 and 1931, the details of which are presented in tabular form, indicates calcium arsenate to be the most efficient and economical arsenical to use with standard 4–6–50 Bordeaux mixture or with 20–80 copper-lime dust for controlling the potato flea beetle on potatoes. It consistently produces higher yields and inhibits beetle damage to a greater degree than arsenate of lead. The relative efficiency of early- and late-season applications of the arsenical depended upon the growth condition of the crop. Where the growth was rapid during the early season, the early applications were more effective than the late ones, and, conversely, where the early growth was slow and late growth rapid, the late applications of the arsenical were the more effective. It was found that the rate of growth can not be predicted with certainty; therefore, the arsenical should be used throughout the season in order to insure the greatest returns.

Not less than eight applications should be made on Russet Rural or other late potatoes and at least six on Cobbler and other early varieties. For spraying, 4 lbs. of calcium arsenate should be added to each 100 gal. of Bordeaux mixture. For dusting, 1 lb. of the arsenical should be used to each 10 lbs. of 20–80 copper-lime dust. The use of greater than the normal strength Bordeaux mixture did not appreciably increase the efficiency of the material in flea beetle control.

Life history and habits of the plum curculio in Delaware, H. L. Dozier, L. L. Williams, and H. G. Butler (*Delaware Sta. Bul. 175 (1932), pp. 45, figs. 18*).—A report upon life history studies of the plum curculio, undertaken in April, 1928, and continued to April, 1930, the major work having been conducted at the Camden entomological substation and in the vicinity of Bridgeville, is presented. During this period especial emphasis was placed on a study of the relation of the curculio to the enormous losses sustained by the peach growers in the State.

Following an introduction the authors consider food plants and nature of injury, methods and rearing apparatus employed in the life history studies, the seasonal life history studies, and natural enemies of the curculio. Much of the data is presented in tabular form.

The fact that the curculio is single brooded in the vicinity of Camden and northward has been proved by studies at the Camden and Newark insectaries where no eggs were obtained for a second generation in 1928 and 1929. The development of the first brood occurred approximately at the same date at Camden and Bridgeville. It is shown that the adult curculio is capable of living for a period of over a year, and that the adults of two years may overlap each other during a period of four months—July to October, inclusive. It is concluded that the spray program must be adjusted from year to year to meet the needs caused by seasonal variations in respect to curculio development.

A list is given of 31 references to the literature.

The white-pine weevil, H. J. MacAloney (*U. S. Dept. Agr. Circ. 221 (1932), pp. 31, figs. 15*).—This is a condensed and less technical publication on the white pine weevil than that previously noted (E. S. R., 63, p. 358).

A correlation of the date of emergence and percentage of survival of the cotton boll weevil with the date of their installation in hibernation cages, P. W. Calhoun (*Fla. Ent., 15 (1931), No. 3, pp. 41–48*).—This is a report

of results obtained during an investigation, the details of which are given in a bulletin by Grossman and the author (E. S. R., 66, p. 252).

It was found that in nine groups of hibernation cages, some placed on the ground in open fields, on the ground in woods, and in trees in woods, the date of confining the weevils in the fall did not determine to any considerable extent the date of their emergence the following spring. In five groups of hibernation cages placed on the ground in open fields, the date of confinement markedly affected the percentage of emergence, the highest percentages of survival always coming from cages in which the weevils were introduced moderately late in the fall. In four groups of hibernation cages placed in trees in woods, the date of confinement of the weevils in the fall seemed only slightly to affect the percentage of survival.

The metabolism of honeybees in winter cluster, C. L. Corkins and C. S. Gilbert (*Wyoming Sta. Bul. 187 (1932), pp. 32, figs. 7*).—In this study the authors found it impossible to draw final conclusions, although certain important tendencies, contrary to previous theory, are noted as follows:

"As the temperature of the air surrounding the bee cluster drops below the temperature of cluster formation, there is a decrease in the rate of metabolism. The activity of cluster formation produces a relatively high rate of metabolism which gradually lowers to a fairly stable constant. Basal metabolism seems to lie in a temperature range between 4 and 8° C. The commonly accepted practice of maintaining cellar temperatures at about 44° F. will not produce a minimum rate of metabolism. Temperatures 6 to 10° F. lower in the cellar will reduce activity and be entirely within the range of safety for the movement of bees onto new stores."

A comparative test of the Caucasian with the Italian race of honeybees, C. L. Corkins and C. H. Gilbert (*Wyoming Sta. Bul. 186 (1932), pp. 24, figs. 7*).—The authors have found that "linear brood measurements and the use of a mathematical formula are practical as a means of making comparative studies of brood production. The Rauchfuss strain of Caucasian bees produce far more honey in this environment than Italian bees from many of the leading strains of this country. The minimum advantage of the Caucasians in honey production is 71 per cent over a 5-year period. In brood production the Caucasians build up more rapidly than the Italians before the main honey flow, the Italians produce more bees during this flow, and then the Caucasians decrease brood rearing more rapidly and bring it to a close earlier than the Italians at the end of the season. In minor characteristics the Caucasians seem to be superior to the Italians in the following regards: Temperament, robbing, whiteness of honey cappings, and concentration of winter stores in the brood chamber. Italians have one distinct advantage in the building of fewer brace and burr combs, and the doubtful advantages of less propolization and the ease of finding unmarked queens."

Report of the Dominion apiarist for the year 1930, C. B. Gooderham (*Canada Expt. Farms, Bee Div. Rpt. 1930, pp. 32, figs. 7*).—An account is given (E. S. R., 64, p. 755) of the year's activities in the apiary, bees as pollinators, queen breeding, the two-queen system, Caucasian v. Italian bees, weak colonies strengthened by package bees, comparison of different sized hives, strength of colony, top entrance hives, middle entrance hives, winter cases with upper entrances, brood count, daily weights of an outside wintered colony, comb v. foundation, effect of sunlight on a colony, disease, wintering, honey inspection, experiments on the storage of honey and on the fermentation of honey, etc.

Factors influencing bee activity in the orchard, R. L. WEBSTER (*Amer. Bee Jour.*, *72 (1932)*, *No. 3*, *pp. 108, 109*, *figs. 4*).—A discussion of the subject as relating particularly to Washington State conditions.

The life history of the carpenter bees, Xylocopa Latr. (Apoidea) [trans. title], S. J. MALYSHEV (*Ztschr. Wiss. Biol.*, *Abt. A*, *Ztschr. Morph. u. Ökol. Tiere*, *23 (1931)*, *No. 3–4*, *pp. 754–809*, *figs. 15*).—This account is accompanied by a list of 75 references to the literature.

Biological studies of sawflies infesting Ribes, H. W. MILES (*Bul. Ent. Research*, *23 (1932)*, *No. 1*, *pp. 1–15*, *pls. 5*, *fig. 1*).—This account deals particularly with the imported currant worm, which is widely distributed in middle and northern Europe and in North America and appears to be confined to food plants of the genus Ribes, particularly *R. grossularia* and *R. rubrum*; with *Pteronidea leucotrochus* Htg., a closely allied species, which is found on the gooseberry but occurs only rarely; and with *Pristiphora pallipes* Lep., which is fairly common and occasionally abundant in Great Britain.

A new species of sawfly of the subgenus Zadiprion, with a description of the male of N. (Z.) vallicola Roh. and a key to the species of the subgenus, W. MIDDLETON (*Ent. Soc. Wash. Proc.*, *33 (1931)*, *No. 7*, *pp. 165–170*).—Under the name *Neodiprion* (*Z.*) *rohweri* the author describes a new sawfly which feeds upon piñon pine (*Pinus monophylla*) in California and *P. edulis* in Colorado.

The cattle-poisoning sawfly (Pterygophorus analis Costa), F. H. S. ROBERTS (*Queensland Agr. Jour.*, *37 (1932)*, *No. 1*, *pp. 41–52*, *figs. 2*).—In this account of *P. analis* the author shows that heavy losses among cattle occur frequently through eating the larvae. Evidence is produced to show that the cattle eat the larvae because their diet is deficient in some substance.

Two new species of sawflies of the subgenus Neodiprion, W. MIDDLETON (*Ent. Soc. Wash. Proc.*, *33 (1931)*, *No. 7*, *pp. 171–176*).—Descriptions are given of two new sawflies of economic importance as defoliators of pine, *N. swainei*, which has been abundant in western Quebec, where it has been infesting jack pine (*Pinus banksiana*), and *N. burkei*, which has been attacking lodgepole pine in the vicinity of West Yellowstone, Mont.

Macrocentrus ancylivorus Rohwer, a polyembryonic braconid parasite of the oriental fruit moth, D. M. DANIEL (*New York State Sta. Tech. Bul. 187* (*1932*), *pp. 101*, *figs. 18*).—This bulletin records the results of four seasons' experiments in colonizing *M. ancylivorus* in peach orchards in Niagara County, N. Y., and of the study of its morphology and biology. This parasite was introduced into western New York in 1928, two years after the oriental fruit moth had been discovered in that area. During the four years following, the parasite increased steadily and parasitized 21.7 per cent of the larvae of the oriental fruit moth collected in twigs in Niagara County. In this 4-year period it constituted 56 per cent of all species of larval parasites obtained. Twenty species of larval parasites are recorded from larvae collected in twigs in this county from 1928 to 1931, six of which had not been reported as attacking the oriental fruit moth in North America.

"The eggs of *M. ancylivorus* are laid in the body cavity of the host larvae throughout the summer. The ovipositing female lays only one egg at each thrust of the ovipositor, and the egg undergoes polyembryonic development. Descriptions of this process are given. Only one parasite larva matures from each host. All stages in the life cycle are described. The first, second, and third larval stages feed internally, but the fourth stage larva emerges and feeds externally, consuming all but the exoskeleton of its host. The host larva has spun its cocoon while the parasite larva is yet in its first stage. The dor-

mant season is passed as a mature, first-stage larva within the body cavity of the host larva. In western New York the life cycle of the parasite synchronizes with that of its host. There are three or four generations of the oriental fruit moth, each of which is parasitized."

Ascogaster carpocapsae Viereck, an important larval parasite of the codling moth and oriental fruit moth, J. A. Cox (*New York State Sta. Tech. Bul. 188 (1932), pp. 26, figs. 14*).—A study of the biology of the braconid parasite *A. carpocapsae*, commenced in 1930 and continued through 1931, is reported upon. This monoembryonic primary parasite of both the codling moth and the oriental fruit moth, which has also been reared from the grape berry moth, striped peach worm, and strawberry leaf roller, attacks its host in the egg stage. The parasite egg develops within the host egg, and the larva enters the body of the host larva before the latter emerges from its egg membrane, but this does not interfere with the normal hatching and subsequent feeding activities of the host. The four larval stages are described. The first, second, and third stages feed internally, but the fourth stage emerges after its host has spun its cocoon and feeds externally, consuming the entire body contents and leaving only the exoskeleton.

In western New York the life cycle of the parasite synchronizes with that of its hosts. One brood and a partial second brood mature on the codling moth. In the case of the oriental fruit moth two broods develop, with part of a third and fourth brood. Adults begin to emerge the first of June and are present continuously until the middle of September. Hibernation takes place as a first-stage larva within the body cavity of the host. A parasitized codling moth larva is only one-fourth to one-third the size of a normal larva, but no appreciable differences in size of oriental fruit moth larvae can be detected as a result of parasitism.

Dibrachys boucheanus Ratz. has been reared from field-collected material as a secondary parasite of *A. carpocapsae* in western New York.

Cane grub parasite for north Queensland from Philippines, E. Jarvis (*Queensland Agr. Jour., 37 (1932), No. 2, pp. 93–97, figs. 9*).—This is a brief account of the recent introduction into north Queensland of the scoliid digger wasp parasite *Campsomeris aureicollis* Lep. from the Philippines for the purpose of combating the grubs of the grayback cockchafer. Information on the biology of the parasite is included.

Notes on a hymenopterous egg-parasite of Nezara viridula L., H. Priesner (*Bul. Soc. Roy. Ent. Égypte, 24 (1931), No. 3–4, pp. 137–139, figs. 3*).—A brief account is given of the occurrence of *Microphanurus megacephalus* Ashm. in Egypt, where it is thought to be of economic importance as an egg parasite of the well-known southern green stinkbug, a pest which has not as yet become of importance in that country. Reference is made to the study of the parasite by Miller in Florida (E. S. R., 60, p. 564).

Parasites aid in control of oriental peach moth, B. F. Driggers (*N. J. State Hort. Soc. News, 12 (1931), No. 2, p. 380*).—This is a brief account of the value of parasites, particularly *Macrocentrus ancylivora* and *Glypta rufiscutellaris*, work with which by the author (E. S. R., 65, p. 54) and by the author and Pepper (E. S. R., 66, p. 558) has been noted, for control of the oriental fruit moth.

About one-half of all the fruit moth larvae feeding in peach twigs during the past six years were destroyed by parasites. This was determined through weekly collections of larvae in different localities throughout the growing seasons. Of the several species concerned, *M. ancylivora* was responsible during this period for more than 90 per cent of all the parasitism of twig-feeding

larvae in southern New Jersey. *G. rufiscutellaris* was equally effective in northern New Jersey from 1925 to 1927, inclusive. The remaining 40 or more species, however, serve as a reserve force, any one of which may increase its effectiveness should the dominant species slow down for any reason. Since 1927 the place of *G. rufiscutellaris* has been taken to a considerable degree by *M. delicatus* and *Pristomerus ocellatus*.

It is pointed out that while these parasites have been particularly effective in holding the pest in check in certain sections for a period of years they can not be depended upon year after year to keep the fruit moth under control.

Experiments upon respiration in the larvae of certain parasitic Hymenoptera, W. H. Thorpe (*Roy. Soc. [London], Proc., Ser. B, 109 (1932), No. B 764, pp. 450–471, figs. 16*).—This is a report of a study conducted with a view to securing direct evidence as to the alleged respiratory function of the "tail" of endoparasitic ichneumonid larvae and the "caudal vesicle" of braconids. It is concluded that the tail, which is such a characteristic feature of many first instar ichneumonids, is of no importance for respiration. It is shown that the experimental results are in accord with those obtained from a study of structure. Regarding the caudal vesicle of the braconids, it is shown that there are marked differences of structure in different genera. Where the vesicle is large and supplied with a good blood circulation, experiments show it to be of undoubted importance as a respiratory organ. It is concluded that in Apanteles and Microgaster the vesicle, when at its maximum development, can not be responsible for more than about one-third of the total respiration. In other forms (Orgilus) its respiratory function is less. Other theories as to the function of the caudal vesicle are briefly discussed.

Modifications in the rearing and distribution of egg parasites of Diatraea in British Guiana, L. D. Cleare, Jr. (*Agr. Jour. Brit. Guiana, 4 (1931), No. 1, pp. 40–42*).—A description is given of the nature and extent of modifications by H. W. Moore and H. E. Box of the method of rearing the egg parasites *Trichogramma minutum* Riley and *Prophanurus alecto* Cwfd. devised by the author (E. S. R., 60, p. 252) for use against the sugarcane moth borers, *Diatraea* spp.

Seasonal history and morphological notes on Polyscelis modestus Gahan, C. C. Hill and H. D. Smith (*Ent. Soc. Wash. Proc., 33 (1931), No. 7, pp. 182–185, figs. 15*).—This insect, the general life history of which was reported by Myers in 1924 (E. S. R., 52, p. 663), at which time it was thought to be a rare parasite of the Hessian fly, has been found by the authors to parasitize in considerable numbers the fall generation of the Hessian fly during the very early spring days. In this contribution they call attention to its present importance and give additional data on its oviposition and morphology.

Contribution to the knowledge of the morphology and ecology of the drug-store weevil parasite Cephalonomia quadridentata Duchaussoy [trans. title], F. van Emden (*Ztschr. Wiss. Biol., Abt. A, Ztschr. Morph. u. Ökol. Tiere, 23 (1931), No. 3–4, pp. 425–574, pl. 1, figs. 53*).—This is an account of the morphology, ecology, and occurrence of the hymenopterous parasite *C. quadridentata*, accompanied by a three-page list of references to the literature.

Descriptions of new trichogrammatid (Hymenoptera) egg parasites from the West Indies, H. L. Dozier (*Ent. Soc. Wash. Proc., 34 (1932), No. 3, pp. 29–37*).—Six new species of egg parasites are described which represent the genera Abbella, Chaetostricha, Ittys, and Ufens.

A new spinning mite attacking raspberry in Michigan, E. A. McGregor (*Ent. Soc. Wash. Proc., 33 (1931), No. 8, pp. 193–195, figs. 6*).—Under the name *Tetranychus mcdanieli* the author describes a new mite found attacking rasp-

berry in southwestern Michigan. This new species is said by R. H. Pettit to appear at berry-picking time during dry seasons, epidemics being so severe as nearly to wipe out the raspberry crop. The leaves turn brown, curl somewhat, and during the latter part of the picking season the fruit fails to develop properly. The new growth is webbed together, the leaves being bound together by silken webs and the mites working on both the under and upper surfaces of the leaves. The pest is said to have been reported for from 10 to 12 years, usually disappearing soon after the crop is harvested.

A second mite which also occurs on raspberries in Michigan appears to be *Paratetranychus ilicis* McG., first described from holly in South Carolina.

The presence of exanthematous fever of Marseille at Constantza, Rumania: *Clinical observations and experiments on the rôle of Rhipicephalus sanguineus in its transmission* [trans. title], D. COMBIESCO and G. ZOTTA (*Compt. Rend. Soc. Biol. [Paris], 108 (1931), No. 38, pp. 1279, 1280*).—The authors found that at Constantza, Rumania, the brown dog tick plays an important rôle as a vector in the transmission of the virus of exanthematous fever.

ANIMAL PRODUCTION

[Studies on livestock] (*Hawaii Sta. Rpt. 1931, pp. 9, 31*).—This report includes a study of the use of raw sugar for increasing the palatability of rations for swine, by L. A. Henke and M. Maneki, and battery brooder methods for raising chicks, by C. M. Bice.

[Experiments with livestock] (*Iowa Sta. Rpt. 1931, pp. 22–31, 33–35, 37, fig. 1*).—This report includes preliminary results of studies in breeding, feeding, nutrition, and management of cattle, horses, swine, sheep, and poultry.

The breeding work includes data on the consequences of inbreeding in Poland China hogs, by J. L. Lush and C. C. Culbertson; inbreeding and other breeding practices used in producing pure breeds of livestock, by Lush; and outbreeding and crossbreeding with swine, by P. S. Shearer and Culbertson.

For the cattle and horse studies data are reported on protein supplements and simple mineral mixtures for fattening calves, by Culbertson, and preparation of feeds for draft colts, by A. B. Caine.

The work with swine included data as to the evaluation of the efficiency of breeding stock, by Culbertson, M. D. Helser, and B. H. Thomas; the efficiency of high and low protein supplemental feeds for gilts, sodium bicarbonate at different levels for developing gilts on alfalfa pasture, protein supplements for fall pigs, and tankage, fish meal, and Big 10 supplement modifications for fattening pigs on rape pasture, by Culbertson; and type tests with swine, by Culbertson and Helser.

Minerals for ewes, by Culbertson, and the effect of iodine fed pregnant ewes upon the size, vigor, bone, coat, and condition of offspring, by Culbertson and Thomas, make up the sheep work.

In the poultry section are found conclusions on the biological value of meat scrap and milk combinations for egg production, and egg yolk and chicken fat as preventives for rickets and slipped tendon of chicks, by E. W. Henderson; the association of date of hatch, date of first egg, and maturity with egg production, by N. F. Waters and Henderson; the influence of various nutritional factors on blindness and range paralysis in chickens, by Henderson, H. L. Wilcke, F. D. Patterson, and C. Murray; and the influence of protein levels and calcium and phosphorus upon rachitis of chicks, by Henderson, Wilcke, and Murray.

Data as to influence of sex upon the quality and palatability of beef are reported, based on studies by Helser, Culbertson, Thomas, J. A. Schultz, and P. M. Nelson.

[Experiments with livestock] (*Missouri Sta. Bul. 310 (1932), pp. 4, 6, 12–15, 18–22, 27, 47–51*).—This report includes preliminary results of studies with cattle, swine, horses, poultry, and rabbits.

The work with cattle included data on the effect of sex on the quality and palatability of beef, self-feeding native fall calves, rations for creep-feeding spring calves, and fattening steer and heifer calves, by E. A. Trowbridge, H. C. Moffet, and M. W. Hazen, and fattening yearling steers on bluegrass pasture, feeding wheat to cattle, processing roughages for winter stock calves, ground rough rice for fattening yearling cattle, and carcass studies of fat heifers and fat cows, by Trowbridge and Moffett.

With swine the studies included data on the adequacy of commonly used concentrates for swine reproduction, by A. G. Hogan and S. R. Johnson; and rations for weanling pigs, a comparison of rice and corn for fattening hogs, and protein supplements for hogs on pasture, all by L. A. Weaver.

The studies in poultry included data on vitamin supplements in chick nutrition, by Hogan and R. V. Boucher; the relation between feed and egg prices in 1930, by H. L. Kempster; and protein concentrates in chick rations; meat scrap and milk in chick rations; allowing chicks to balance their own ration; influence of yeast on growth of White Leghorn chicks; dried skim milk in rations for baby chicks; rate of growth of Rhode Island Red, White Rock, and White Leghorn pullets; influence of time of hatching on rate of growth; and influence of age of breeding stock on rate of growth of White Leghorns, White Rocks, and Rhode Island Reds, by Kempster and E. M. Funk.

Other studies were on the growth of draft colts, by Trowbridge, D. W. Chittenden, and S. Brody; changes in energy and nitrogen metabolism during growth in various animals, by Brody, Hogan, Kempster, A. C. Ragsdale, Trowbridge, W. C. Hall, and U. S. Ashworth; and the nutritional requirements of rabbits, by Hogan and W. S. Ritchie.

[Studies with livestock] (*Nevada Sta. Rpt. 1931, pp. 12, 13*).—This report includes partial results of studies on feeding and finishing range ewes and lambs on barley and alfalfa hay, by C. E. Fleming, and a comparison of bluegrass and white clover pastures for sheep and the relative consumption of forage by lambs, yearling sheep, and older ewes, by Fleming, M. R. Miller, and A. Young.

Methods of livestock improvement, T. MURARI (*Madras: Srinivasa Varadachari & Co., 1931, pp. XXIII+372, pls. 2, figs. 3*).—In the preparation of this treatise the author studied the prevailing methods of animal breeding and livestock improvement in Europe and made critical analyses of these methods with a view to improving them.

Raising beef cattle on farm and range, F. W. FARLEY, edited by J. M. HAZELTON (*Kansas City, Mo.: Walker Pubs. Inc., 1931, pp. 179+[5], figs. 47*).—This treatise was prepared to assist breeders to develop more practical plans for raising beef cattle. The recommendations made are based on the experiences of successful breeders and feeders.

The comparative values of cottonseed cake and ground yellow corn for the supplemental feeding of cows and weaned calves on the range, J. L. LANTOW (*New Mexico Sta. Bul. 202 (1932), pp. 7*).—This study was undertaken to determine the relative values of cottonseed cake and ground yellow corn as supplemental feeds for range cattle. Tests were run for 2 years, and the

length of the feeding periods were 84 and 56 days, respectively. There were 17 cows and 17 calves in lot 1 and 16 cows and 18 calves in lot 2 the first year, while during the second year there were 13 cows and 17 calves in lot 1 and 12 cows and 10 calves in lot 2. The cows in lot 1 were fed 1 lb. and the calves 0.5 lb. of cottonseed cake per head daily, while a like amount of ground yellow corn was fed to the animals in lot 2. The first test showed a difference of 48 lbs. per head in gains of cows and 12.7 lbs. in gains of calves in favor of the cottonseed cake. The second year showed an advantage of 42.6 lbs. for cows and 12 lbs. for calves in favor of cottonseed cake.

It was concluded that cottonseed cake had an advantage over ground yellow corn in gains produced on cattle, and that the advantage was as great or greater with cows as with weaned calves. The cake was more palatable than the corn, and it was possible to feed it for a more uniform individual consumption than it was with corn.

Observations on the bacteriology of slimy beef, S. C. Prescott, J. F. Hale, and G. E. White (*Jour. Bact., 21 (1931), No. 1, p. 26*).—The slimy coating which forms on beef in cold storage and which gives rise to disagreeable odors was found to be due to a practically pure culture of a bacterium capable of growth at temperatures slightly above the freezing point, especially in the presence of high humidity and poor ventilation.

Cost of fattening lambs in 1930–31, D. H. La Voi and K. T. Wright (*Michigan Sta. Quart. Bul., 14 (1932), No. 4, pp. 279–283, fig. 1*).—This study was made to obtain information on the cost of fattening lambs, to show the relationship between the practices followed and the results obtained, and to compare hand and self-feeding. A total of 29 lamb feeders cooperated in keeping the necessary records.

There were 21,158 lambs purchased and 20,042 lambs sold. The lambs averaged 66.6 lbs. in initial weight and were on full feed an average of 69 days, during which time they gained 20.4 lbs. per head. The average initial cost was $7.18 per 100 at the farm, and they brought $9.15 when sold. Marketing costs averaged 57 cts. per 100 lambs. The lambs consumed an average of 1.2 lbs. in grain per head daily. The cost of a pound of gain averaged 12.5 cts., of which 6.6 cts. was charged to grain and 3.2 cts. to roughage.

There was considerable difference of opinion as to the relative merits of hand and self-feeding, but there was little difference in the death losses under the two systems. With hand-feeding the daily intake of feed could be regulated, and it was possible to use a greater percentage of the heavier home-grown feeds. It cost 1 ct. per pound more to produce 1 lb. of gain by hand-feeding than by self-feeding, but there was more margin between purchase price and sale price of hand-fed lambs. Hand-fed lambs averaged 6 lbs. lighter in initial weight and were kept on the farms 35 days longer than the self-fed lambs.

The 10 feeders having the highest return per lamb averaged $1.58 per head above the cost of lamb, feed, and interest as compared to 86 cts. for the average of all feeders. No one ration or combination of feeds gave best results.

[Poultry experiments] (*Massachusetts Sta. Bul. 280 (1932), pp. 238, 239*).—This report includes preliminary results of studies on broodiness in poultry, a genetic study of Rhode Island Red color, a determination of genetic laws governing results of inbreeding, and factors affecting egg weight and shell character in domestic fowl, by F. A. Hays; and breeding poultry for egg production, by Hays and R. Sanborn.

Certification of poultry, F. D. Reed (*New Hampshire Sta. Circ. 38 (1932), pp. 4, figs. 3*).—The requirements for certification, the procedure and division of

flocks, the use and importance of certified birds as breeders, the selection of males, and the cost of certification are discussed in this publication.

The battery system of poultry keeping, G. W. Wesetmore (*London: Arts & Crafts Pub. Co., [1932], pp. 79, pls. 20*).—The feeding management, and housing of birds under the battery system are discussed in this treatise.

Hatching turkey eggs, F. E. Mussehl (*Nebraska Sta. Bul. 269 (1932), pp. 7*).—Continuing this study (E. S. R., 65, p. 862), it was found that the optimum temperature for cabinet-type incubators was between 99.75 to 100° F. and for sectional or nonforced draft incubators 102° at the top of the eggs the first week, 102.5° the second and third weeks, and 103° the fourth week. The average humidity of the incubator should be kept at approximately 60 per cent relative, with a range of from 40 to 70 per cent. The ventilation requirements increased as the incubation period progressed. It was also recommended that the eggs be turned gently twice a day until the twenty-fourth day of incubation.

DAIRY FARMING—DAIRYING

[Experiments in dairy production and dairying] (*Iowa Sta. Rpt. 1931, pp. 31, 32, 33, 53, 54, 55, 56, 57*).—Preliminary results of experiments with dairy cattle feeding and management and in the manufacture and use of dairy products are included in this report.

From the work with dairy cattle data are reported on the influence of the physical properties of milk on its rate of digestion in vivo, and cracked soybeans v. a mixture of cracked soybeans, linseed meal, and cottonseed meal as a source of protein for milk production, by C. Y. Cannon and D. L. Espe; and variations in milk and fat production caused by injecting oil into the udder before milking, and the influence of fat upon the digestibility of milk by calves, by Cannon.

Dairying studies were on the influence of acidity in cream on fat losses in buttermilk, and the effects of lipins and of sulfonation of unsaturated fats on certain modified Babcock tests of fat in buttermilk, by E. W. Bird; and the significance of numbers and types of bacteria in butter from the standpoint of its keeping quality, the bacterial efficiencies secured in pasteurizing milk from individual farms, an organism causing rancidity in butter, microorganisms causing surface taint in butter, the germicidal properties of milk, methods of preparing butter cultures for mail shipment, churn sanitation, and the importance of acetylmethylcarbinol and diacetyl in butter cultures, by B. W. Hammer.

[Studies in dairying and dairy products] (*Massachusetts Sta. Bul. 280 (1932), pp. 211–213, 230–232*).—In this report are included partial results of studies on factors affecting the aging time of ice cream mixes, by K. E. Wright; the utilization of frozen fruits in ice cream and ices, and of ice creams high in fat content, by M. J. Mack; and the effect of various initial aging temperatures on the behavior of gelatin in ice cream, by W. S. Mueller.

The dairy production studies include milk substitutes in the growing of young calves, high roughage and low grain v. low roughage and high grain for dairy cows, and mineral requirements for the growth of dairy heifers, by J. B. Lindsey and J. G. Archibald (E. S. R., 65, p. 767); and studies of the chemistry of pasture grasses, by Archibald and E. Bennett.

[Experiments with dairy cattle and dairy products] (*Missouri Sta. Bul. 310 (1932), pp. 22–24, 28–30*).—The studies with dairy cattle covered in this report included data on the time of circulation of blood in the bovine, the volume of plasma and blood in dairy cattle, the composition of blood of dairy cattle, and specific gravity of the blood and plasma of dairy cattle, by C. W.

Turner and H. A. Herman: the individuality of the four quarters of the cow's udder, by Turner; growth investigations, by A. C. Ragsdale and S. Brody; and methods of evaluating and proving dairy sires, and the inheritance of polythelia in dairy cattle, by W. Gifford.

Under dairy products, data are reported on the freezing properties, stability, and physical qualities in chocolate ice cream, by W. H. E. Reid and W. E. Painter; the deodorization of cream for butter manufacture, by Reid and J. W. Myers; methods of reducing and preventing serum separation in 20 per cent cream without homogenization, by E. R. Garrison and M. E. Powell; and the manufacture of cottage cheese involving the use of skim milk powder, by Reid and C. L. Fleshman.

[Studies with dairy cattle] (*Hawaii Sta. Rpt. 1931, pp. 7, 8*).—Partial results on experiments with dairy cattle, including feeding raw rock phosphate, effect of sugarcane molasses on milk yield and reproduction, and feeding sprouted oats to breeding dairy cows, are contained in this report by L. A. Henke and M. Maneki.

[Studies with dairy cattle] (*Nevada Sta. Rpt. 1931, p. 17*).—Some of the results of a test of the economic efficiency of alfalfa hay as a sole ration for dairy cattle and its relation to sterility, by F. B. Headley, are reported.

Older dairy bulls being used in Michigan, C. NELSON and G. A. BOWLING (*Michigan Sta. Quart. Bul., 14 (1932), No. 4, pp. 269–271*).—A survey was made of the bulls owned in 33 Michigan Dairy Herd Improvement Associations for 1931. It was found that these dairymen are selecting bulls with record dams, and that there was a tendency to retain these bulls in service for a longer period than is usual.

Factors influencing the blood-sugar level of dairy cattle, R. E. HODGSON, W. H. RIDDELL, and J. S. HUGHES (*Jour. Agr. Research [U. S.], 44 (1932), No. 4, pp. 357–365, fig. 1*).—Continuing this study (E. S. R., 64, p. 872) at the Kansas Experiment Station, blood samples from 140 dairy cattle were analyzed for sugar content.

Shortly after birth calves had a blood sugar content of about 100 mg per 100 cc of blood. This content decreased until about 2 years of age, after which little change was observed. Analyses of 222 samples of blood from 74 animals between the ages of 2 and 8 years showed a mean blood sugar content of 53.03 ± 0.297 mg per 100 cc with a range of from 35 to 74 mg. There were no significant breed differences.

Cows producing a liberal amount of milk had a slightly lower blood sugar level than dry cows or low-producing cows. No increase in blood sugar followed feeding, but a slight increase was observed at about 3 p. m., probably due to increased activity about the barn previous to the afternoon feeding. Fasting heifers decreased their blood sugar level to about 50 per cent, while the administration of a solution of glucose increased the level as much as 200 per cent. Excitement increased the blood sugar, and cows and heifers showed higher levels during oestrum than at other times.

Increasing the vitamin-D content of milk, W. E. KRAUSS, R. M. BETHKE, and C. F. MONROE (*Ohio Sta. Bimo. Bul. 156 (1932) pp. 117–121*).—Continuing this study (E. S. R., 63, p. 66), two cows were kept under winter feeding conditions except for a short period each day when they were allowed to obtain water and exercise in a yard free of vegetation. They were fed a basal ration of alfalfa hay, corn silage, corn, oats, bran, and linseed meal. The trial was divided into periods of from 3 to 4 weeks each. During periods 1, 4, and 7 the animals had 50 cc of corn oil added to the basal ration and during periods 2, 3, 5, and 6 received 7,500, 15,000, 100,000, and 200,000 Steenbock rat units of

vitamin D in the form of irradiated ergosterol daily. During the last five days of each period the milk produced by both cows was combined, separated, and churned, and the resulting butter was rendered into pure fat.

The amount of vitamin D in the fat was determined by the curative method with both rats and chicks and the curative and prophylactic methods with rats. These results showed that the vitamin D content of the butterfat increased from 0.17 rat unit per gram during the control period to 2.5 units per gram as the vitamin D intake of the cows increased up to 200,000 units daily. Better calcification was obtained with 40 mg of fat from period 6 than with 600 mg of fat from period 1.

At the end of the test the cows were slaughtered and a pathological study of their organs was made by H. Goldblatt of Western Reserve University. No abnormalities due to the method of feeding were found.

Based on the results obtained, it was concluded that the feeding of irradiated ergosterol to cows would greatly increase the vitamin D content of milk without affecting the production or physical condition of the animals. However, the cost of erogosterol, together with the inefficiency with which it is transferred to milk, makes its general use uneconomical.

A seven-year study of an eastern Nebraska milk supply, P. A. Downs (*Nebraska Sta. Bul. 270 (1932), pp. 23, figs. 5*).—This bulletin reports a study of the milk delivered to the department of dairy husbandry by producers during the years 1924–1930. The barns, methods of stabling, milk houses, cooling equipment, utensils, the quality of the milk delivered as shown by sediment scores and bacterial counts, and the effects on quality of milk of daily temperatures, method of cooling, use of milking machines, length of haul, and tenure of producers are discussed.

"Systems of reports to patrons on sediment and bacterial count brought about only slight improvement. After the inauguration of bonuses and deductions based upon milk quality, improvement was much more rapid."

Sterilization of dairy equipment, W. L. Mallmann (*Michigan Sta. Quart. Bul., 14 (1932), No. 4, pp. 244, 245*).—Chemical sterilization of dairy equipment with chlorine preparations and the methods of testing and using the solutions are discussed in this article.

The Babcock test for fat in milk, O. R. Overman and O. F. Garrett (*Illinois Sta. Circ. 390 (1932), pp. 4, figs. 2*).—A practical publication explaining the application and use of the Babcock test, together with observations as to precautions to be taken in obtaining samples and in procedure.

Manual for milk testers in New Jersey, H. H. Tucker (*New Jersey Stas. Bul. 539 (1932), pp. 31, figs. 17*).—This bulletin was designed as a handbook to bring up to date the adopted methods of sampling and testing milk, skim milk, cream, and ice cream for butterfat and for testing milk for solids and acidity. This purpose was to serve as a reference for applicants for testers' licenses and weighers' and samplers' permits and for users of the Babcock and Gerber methods of testing dairy products.

VETERINARY MEDICINE

Veterinary obstetrics and zootechnics, H. N. Beeman (*Washington, D. C.: Amer. Remount Assoc., 1932, pp. 181*).—A small practical work.

[Contributions on animal pathology] (*Calif. Dept. Agr. Mo. Bul., 20 (1931), No. 8, pp. 515–545, figs. 6; 550–590, figs. 15*).—The contributions here presented include the following: Progress in Bang's Disease Control, by H. P. Bonnikson (pp. 515–518); Anaplasmosis in Cattle, by A. G. Gierke (pp. 519–521); Some

Infectious Diseases of Sheep, by R. H. Mills (pp. 522–527); Disease Control in State Institution Herds, by H. F. Little (pp. 528–532); Feeds in Relation to Disease of Swine, by R. Jay (pp. 533, 534); The Calf Segregation Method of Tuberculosis Eradication, by E. M. Keef (pp. 535–539); Eradication of Sheep Scabies from San Clemente Island, by G. A. Pfaffman (pp. 540–543); The Control of Liver Fluke, by R. Jay (pp. 544, 545); Common Worm Parasites of Poultry in California and Methods of Controlling Them, by H. W. Graybill (pp. 550–556); The Sanitary Control of Poultry Diseases, by H. A. Hoffman (pp. 557–562); Fowl Pox and Its Control, by E. E. Jones (pp. 563–570); The Control and Eradication of Pullorum Disease, by H. W. Graybill (pp. 571–576); The Whorled Milkweed as a Poisonous Plant for Poultry, by H. W. Campbell (pp. 577–582); Manure Disposal as a Sanitary and Economic Problem on the Poultry Ranch, by W. J. Pistor (pp. 583–588); and Restrictions on Possession and Use of Tuberculin, by H. P. Bonnikson (pp. 589, 590).

[Work in animal pathology] (*Iowa Sta. Rpt. 1931, pp. 36, 37, 88, 89*).—The progress of work during the year (E. S. R., 65, p. 179), particularly in avian pathology, is briefly dealt with, including data on tracheitis and range paralysis in poultry, and poultry diseases and parasites in Iowa, by C. Murray, E. W. Henderson, H. L. Wilcke, and F. D. Patterson; breeding for resistance to fowl typhoid in poultry, by W. V. Lambert and Henderson; and genetic investigation of resistance and susceptibility to disease in laboratory animals, by Lambert.

Report of the veterinary director general for the year ending March 31, 1931, G. Hilton et al. (*Canada Dept. Agr., Rpt. Vet. Dir. Gen., 1931, pp. 76, pls. 4*).—This annual report on the work of the year (E. S. R., 62, p. 772) incorporates reports of the Contagious Diseases Division, by A. E. Cameron (pp. 20–26), and the Pathological Division, by E. A. Watson (pp. 49–60). Accounts of Avian Tuberculosis in Cattle, by C. A. Mitchell (pp. 61, 62); Repeated Intradermal Tuberculin Tests of Cattle with Necropsy Findings, by C. W. McIntosh (pp. 62–65); Studies on the Control and Elimination of Bovine Infectious Abortion, by C. A. Mitchell (pp. 66–70); Research on Swamp Fever or Infectious Equine Anaemia, by L. M. Heath (pp. 70, 71); Records of Insects Affecting Wild Life in B. C., by E. A. Bruce (pp. 71–73); Infectious Bronchitis of Fowls (*Laryngotracheitis*), by C. H. Weaver (pp. 74, 75); and *Dermacentor albipictus* as a Parasite of Moose and Cattle in Nova Scotia, by P. J. G. Plummer (p. 76), are presented in appendixes.

Veterinary research division, S. Youngberg (*Philippine Bur. Anim. Indus. Ann. Rpt. 1930, pp. 352–380, pls. 2*).—This report deals with rinderpest vaccine, antirinderpest serum, biological products (hog cholera virus, rabies, vaccine, and fowl pox vaccine), clinical laboratory service, etc., including an outline of experiments on rinderpest vaccine.

Annual administration report of the Madras Civil Veterinary Department for the year 1930–31, P. T. Saunders et al. (*Madras Civ. Vet. Dept. Ann. Admin. Rpt. 1930–31, pp. II+180+8, pls. 7*).—An account is given of the research and of control work with infectious diseases of livestock in Madras, including reports of district veterinary officers.

[Contributions on animal pathology and therapeutics in India] (*Indian Jour. Vet. Sci. and Anim. Husb., 1 (1931), No. 4, pp. 283–300; 301–322, figs. 4; 323–336; 337–346, fig. 1; 347–351*).—The contributions presented are as follows: Prophylaxis against Equine Surra by Means of "Bayer 205" (Naganol)—A Review of the Literature, by S. K. Sen (pp. 283–295); The Diagnosis of "Redwater" (Piroplasmosis) in Indian Cattle, by H. Cooper and P. R. K. Iyer (pp. 296–300); Tick Infestation in the Coastal Tract of North Kanara District, by

R. N. Naik (pp. 301–322); Anti-Rabies Immunization—Value of Killed Carbolised Virus in Cases of Wolf-Bite, by G. Stuart and K. S. Krikorian (pp. 323–331); Bovine Nasal Granuloma, by G. E. Oxspring (pp. 332–336); Artificially Induced Hypoglycemia and Hypocalcemia in the Cow and the Relationship to Parturient Paresis or Milk Fever, by W. E. Petersen, E. A. Hewitt, W. L. Boyd, and W. R. Brown (pp. 337–346) (E. S. R., 68, p. 272); and The Influence of Diet upon the Course of Coccidiosis Infection in Chickens (pp. 347–351).

[Studies in comparative pathology in Japan] (*Jour. Japan. Soc. Vet. Sci., 10 (1931), Nos. 3, pp. 153–299, pls. 5, figs. 6; 4, pp. 305–401, pls. 7*).—The papers presented in No. 3 include the following Japanese articles: On the Precipitin Reaction on Bovine Contagious Pleuropneumonia, by S. Ono (pp. 153–180, Eng. abs. pp. 177–180); Studies on Contagious Pleuropneumonia in Cattle—VII, Contributions to the Diagnosis of Contagious Pleuropneumonia in Naturally Infected Cases, by S. Yamagiwa, K. Itabashi, and S. Ito (pp. 181–200, Eng. abs. pp. 198–200), and VIII, On the Results of Observations Extended for a Long Period on the Invaded Herd of "0" Farm in Inner Mongolia, by K. Itabashi, S. Yamagiwa, S. Ito, and T. Kozuma (pp. 201–213, Eng. abs. pp. 211–213); Studies on "Hypodermatotoxin," Toxin Obtained from the Larvae of *Hypoderma* sp. at the Esophageal Stage—I, Its Action on the Blood Coagulation, by S. Ono (pp. 214–231, Eng. abs. pp. 230, 231); Studies on the Intraplantar Inoculation of Rabic Virus—II, Experiments with Virus Fixe (Second Report), by K. Itabashi (pp. 232–245, Eng. abs. pp. 244, 245) (E. S. R., 63, p. 771); On the Variant Types of *Bacillus mallei*—I, Transformation, Morphology of Colony and Bacterial Cell, Cultural Behavior, Virulence of Types, by T. Toyoshima, K. Okuda, I. Mochida, and S. Ijichi (pp. 246–268, Eng. abs. pp. 265–268); Results of Tests of the Makimura Serochemical Method of Diagnosing Equine Infectious Anemia, by T. Ikeda (pp. 269–272, Ger. abs. p. 272); A Study of the Complement Fixation Reaction in Inoculated Rinderpest, by M. Sasaki (pp. 273–280, Ger. abs. pp. 279, 280); and Experimental Studies on *Eimeria avium*, by S. Nohmi (pp. 281–299, Eng. abs. pp. 295–299).

The contributions in No. 4 include the following Japanese articles: Experimental Studies on *Eimeria avium*, II, by S. Nohmi (pp. 305–330, Eng. abs. pp. 323–328); Studies on Hemorrhagic Septicemia Organisms, Especially on Their Variability—Report I, Study on So-called Fowl Cholera Organisms (pp. 331–349, Eng. abs. pp. 348, 349), Report II, Studies on Hemorrhagic Septicemia Organisms Isolated from So-called Swine Plague (pp. 350–362, Eng. abs. pp. 361, 362), and Report III, Studies on Hemorrhagic Septicemia Organisms Isolated from Cattle (pp. 363–366, Eng. abs. p. 366), all by Y. Ochi; Serological Differentiation of the Two Forms of Rinderpest by Means of Complement Fixation, by J. Nakamura (pp. 367–373, Ger. abs. p. 373); Studies on the Intraplantar Inoculation of Rabic Virus—III, On the Localization of the Virus in the Lumbar Cord of Guinea Pigs, by K. Itabashi (pp. 374–389, Eng. abs. pp. 379, 380); Hemopoiesis in the Liver and the Bone Marrow of the Carrier Pigeon Following Splenectomy, by Y. Toryu (pp. 381–390, Eng. abs. pp. 389, 390); and, in German, The Agglutination Behavior of *Bact[erium] bronchisepticum*, by T. Kouno and K. Hashimoto (pp. 391–401, Japan. abs. pp. 400, 401).

Annual report of the chief veterinary research officer for the year 1930, J. Walker et al. (*Kenya Colony Dept. Agr. Ann. Rpt. 1930, pp. 95–189*).—Research work (E. S. R., 64, p. 677) is reported under the headings of East Coast Fever, including transmission experiments with ticks, etc. (pp. 100–108), and Rinderpest (pp. 108–113), both by J. Walker; Enzootic Hepatitis or Rift Valley Fever (An Undescribed Virus Disease of Sheep, Cattle, and Man)

(pp. 113-126) and Nairobi Sheep Disease (pp. 127-132), both by R. Daubney and J. R. Hudson; Contagious Pustular Dermatitis of Sheep, by J. R. Hudson (pp. 132, 133); Some Parasites of Dogs in Kenya (pp. 133-136), A Preliminary Note on Spirochaetosis of Pigs in Kenya Colony (pp. 136-139), and Observations on Vaccination of Young Chicks One to Eight Days Old against Fowl-Pox (pp. 140-146), all by W. B. C. Danks; Coccidiosis in Birds (pp. 146-149) and Plant Poisoning (pp. 149, 150), both by J. R. Hudson; Report on Tick Survey in Kenya Colony, by E. A. Lewis (pp. 151-162); and Horse-Sickness (pp. 163-188).

The experimental vaccination of chicks against fowl pox (pp. 140-146) led to the conclusion that young chicks from one to eight days old can be successfully vaccinated with live fowl pox virus and immunized against fowl pox. However, it is not considered advisable to vaccinate chicks under a month old with live fowl pox virus, unless in exceptional cases where considerable mortality may be expected to occur from some heavy outbreak of the disease. The immunity produced does not, in the majority of cases, protect against retest with live virus after two months, although it is probably efficacious against natural infection beyond that period. Although there is less risk of mortality, pigeon pox virus in the unexalted state gives very little protection against retest with live fowl pox virus.

Immunological studies in reptiles and their relation to aspects of immunity in higher animals, E. Grasset and A. Zoutendyk (*So. African Inst. Med. Research Pubs., No. 29 (1931), pp. 377-459, figs. 28*).—The several chapters of this contribution deal, respectively, with the susceptibility of reptiles to intoxications of bacterial origin (pp. 383-432), susceptibility of reptiles to Viperidae and Colubridae venoms (pp. 433-437), aptitude of response to antigens and attempts at active immunization of reptiles (pp. 438-442), passive immunity among reptiles (pp. 443, 444), hereditary aspects of immunity among reptiles and the passage of the antigens and antibodies into the eggs and young (pp. 445-452), and a comparative study of the above aspects of the subject in the lower and higher Vertebrata and an attempt at immunological and biological interpretation (pp. 453-457).

The effect of irradiation on the electrophoretic velocity, viability, agglutinability, lysis, and pH of Escherichia coli, M. W. Lisse, R. P. Tittsler, and G. R. Sharpless (*Pennsylvania Sta. Bul. 276 (1932), pp. 44, figs. 3*).—The authors find that "the Falk cell lends itself to obtaining practically identical results with capillaries of the same length, etc. Electrophoretic velocities indicate a recovery period following sublethal irradiation. With lethal periods of irradiation, a decrease in charge accompanies death of *E. coli*. Agglutination can not accurately measure the effect of sublethal irradiation, and indicates a recovery period. Lysis and increase of pH accompany irradiation. A time lag, pointed out by Mooney, was observed by electrophoretic measurements."

An extensive bibliography is appended.

A comparison of carbon tetrachloride and tetrachlorethylene, G. W. Rawson (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 4, pp. 600-603*).—Following a discussion of the effects of tetrachlorethylene on the respiratory organs, the author deals with its effects on the liver and other organs and also in case of calcium deficiency.

The poisonous action of ingested saponins, A. J. Ewart (*Aust. Council Sci. and Indus. Research Bul. 50 (1931), pp. 28, figs. 3*).—Following an introduction, the author reports upon the toxicity of saponins, salts, and tannin to water snails (Bulimus) (pp. 10-12); the influence of ingested saponins (pp. 12-20); and feeding experiments with guinea pigs (pp. 20-28). In addition to

a detailed investigation of the toxic action of saponins and of saponin-containing plants on guinea pigs, evidence is given suggesting that certain obscure diseases of stock in various parts of the world are due to the prolonged ingestion of plants containing active saponins.

An epizootic of livestock in Matto Grosso [trans. title], B. BRUNO (*Rev. Zootech. e Vet. [Brazil], 17 (1931), No. 1, pp. 15–40; Eng. abs., pp. 38–40*).—An account is given of what is thought to be a new disease that appeared in 1925 in the district of Rosario, State of Matto Grosso, Brazil, affecting cattle and to a minor degree horses and rarely hogs. Two distinct clinical types were observed, a paralytic form more frequently met with and a rabid form rarely noted. Although resembling rabies, this affection was apparently excluded, since it did not occur in dogs in the region and they were resistant to contacts; pigeons were resistant to intraocular inoculation of the virus; the virus could not be conserved in glycerol; the symptoms as observed in guinea pigs and rabbits were different; Negri bodies could not be detected in Ammon's horn; and there was an undiminished period of incubation in the inoculated guinea pigs.

Preliminary experiments in the transmission of anaplasmosis by horseflies, C. E. SANBORN, G. W. STILES, JR., and L. H. MOE (*Oklahoma Sta. Bul. 204 (1932), pp. [16], figs. 4*).—This is a report of a cooperative project by the station and the U. S. D. A. Bureau of Animal Industry.

In continuation of the work previously noted (E. S. R., 64, p. 748), four cases of experimental transmission of the disease from infested cattle to healthy animals are reported upon. The first animal, a cow four years old, was subjected to 43 bites (25 direct, 18 delayed feeding) from June 13 to 27, inclusive, by *Tabanus gracilis* Wied., *T. fuscicostatus* Hine, *T. sulcifrons* Macq., *T. venustus* O. S., and *Silvius pollinosa* Will. that had previously fed on an acute case of anaplasmosis. Her temperature remained normal from the beginning of the experiment until July 21 when the symptoms of the disease appeared, death resulting on July 25.

The second case, a 12-year-old cow, was subjected to 61 direct bites and 18 delayed bites by *T. gracilis* during a period of 8 days, the flies having previously fed on an acute case of the disease. The cow remained normal for 1 month after the last fly bite, or 38 days following the first direct bite, when it developed a mild case of anaplasmosis and recovered after a sickness of about 10 days.

The third cow was subjected to 24 bites inflicted by *T. sulcifrons*, of which 16 were direct and 8 delayed feedings, extending over a period of 6 days, the flies having been fed on an acute case. The cow developed a very mild typical case 66 days following the first feeding, or 60 days after the last bite, but returned to normal after about 1 week's illness.

The fourth cow received 47 direct bites and 68 delayed bites by *T. venustus* which had previously fed on a known carrier. It showed typical clinical symptoms of anaplasmosis 42 days after the last fly bite, or 73 days following the first exposure to flies, later recovering.

An account is given in the appendix of the habits of the flies used.

Brucella abortus in the blood stream of swine, W. E. COTTON and J. M. BUCK (*North Amer. Vet., 13 (1932), No. 2, pp. 35–43*).—The authors report having found that boars and pregnant sows may be regularly infected with *B. abortus suis* through the conjunctiva. When so infected, the blood stream becomes invaded with the organism in such numbers as to be demonstrated through guinea pig inoculations. It does not appear to remain in the blood stream for very long, and there appears to be little relation between parturi-

tion and the appearance of the organisms in the blood. However, there is some evidence to indicate that occasionally either it may remain in the blood stream for a considerable time or may recur. Abortions do not appear to occur with regularity in swine following infection, at least by the cojunctival route. The organism may sometimes be recovered from the blood of sows giving an agglutination titer as low as 1 to 50.

Further researches on Bang's disease, W. E. COTTON and J. M. BUCK (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 3, pp. 342–355*).—The authors report upon the progress of work conducted in continuation of that of the preceding year (E. S. R., 65, p. 265). That relating to the occurrence of the abortion organism in the blood stream of swine is noted above.

"The data presented give further evidence to show that the conjunctival method of exposure transmits the disease to pregnant cattle and swine with remarkable regularity, and strengthens the results of our earlier experiments, which indicated that the infection may pass through the unbroken skin, and also suggests the possibility that these routes may be of importance in nature. The data also throw additional light on the value of *Br[ucella] abortus* agglutinins in blood and milk as indicators of udder infection and on the relation of the virulence of *B. abortus* used for vaccine to the degree of immunity induced by it. Additional evidence is given to show that while the latter is in general directly proportional to the former, yet a strain of such moderate virulence that it will rarely become localized in the udders of vaccinated cattle still retains, in a large measure, its immunity-producing properties. It is pointed out also that additional data support results of earlier experiments which indicate that cattle possess a marked resistance to infection with the swine type of *B. abortus* through natural means of infection."

The effect of pasteurization upon Brucella melitensis var. suis, C. MURRAY, S. H. MCNUTT, and P. PURWIN (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 3, pp. 336–342*).—The authors found in pasteurization tests in which a standard pasteurizing outfit was used that a temperature of 62 to 63° C. (143.6 to 145.4° F.), when applied 3 minutes, is sufficient to destroy both the bovine and porcine varieties of the abortion organism.

The results indicate that "the usual pasteurization temperature of 62 to 63° for 30 minutes gives an ample factor of safety, providing the pasteurizer is operated in the proper manner. With the lid of the pasteurizer open, a much longer time exposure to this temperature is required and the results obtained are irregular and uncertain, in that viable organisms were recovered from the foam even after pasteurization for 30 minutes. The absolute necessity of a flush gate valve is also indicated, for in those experiments in which an ordinary faucet outlet was used viable organisms were obtained from the outlet after pasteurization for 30 minutes, whereas with the outlet closed by a stopper on the inside no living organisms remained after exposure for 3 minutes. The experiments emphasize the importance of carefully conducted operations in pasteurization if successful results are to be obtained."

Problems in controlling and eradicating Johne's disease, V. S. LARSON, B. A. BEACH, and W. WISNICKY (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 3, pp. 446–463*).—A discussion of the problems met with in work with Johne's disease.

Investigations on the passive immunization of small animals in vesicular stomatitis, K. WAGENER (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 4, pp. 579–599*).—The author has found in work in Germany that "guinea pigs and white rats can be completely protected against a cutaneous inoculation of vesicular stomatitis virus by the administration of homologous or heterologous

immune or convalescent serum, given either simultaneously or 24 hours previously. The passive immunity produced is strictly specific in regard to the strain of virus, and its duration depends directly on the dose and potency of the serum administered as well as on the virulence of the virus used for the inoculation. The passive immunity test may be used for standardization of the virus. Guinea pigs or rats which developed no lesions after treatment with serum and virus are not always immune, since some of them can be infected when reinoculated two to four weeks later."

The possibility of distinguishing vesicular stomatitis and foot-and-mouth disease viruses by means of the passive immunity test is discussed.

Recent research throws some new light on the tubercle bacillus, A. F. SCHALK (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 3, pp. 436–445*).—This is a review of recent progress in the study of the causative organism of tuberculosis.

A study of so-called skin-lesion and no-visible-lesion tuberculin-reacting cattle, L. L. DAINES and H. AUSTIN (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 3, pp. 414–434*).—This is a detailed account of the work previously noted (E. S. R., 67, p. 315).

A memorandum on bovine tuberculosis in man, with special reference to infection by milk (*[Gt. Brit.] Min. Health, Rpts. Pub. Health and Med. Subjs. No. 63 (1931), pp. 25*).—Following a brief introduction, the report deals with the incidence of human tuberculosis in England and Wales, the proportion of cases attributable to bovine infection, the incidence of tuberculous disease in cattle, tuberculous milk, methods of controlling infection, and pasteurization.

Progress of cooperative tuberculosis eradication work, A. E. WIGHT (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 3, pp. 399–409, fig. 1*).—This is a report upon cooperative eradication work with tuberculosis of livestock in the United States.

Tularaemia: Occurrence in the sage hen, Centrocercus urophasianus, also report of additional cases following contacts with quail, Colinus virginianus, R. R. PARKER, C. B. PHILIP, and G. E. DAVIS (*Pub. Health Rpts. [U. S.], 47 (1932), No. 9, pp. 479–487*).—Data secured from a small area near Roy, Fergus County, Mont., during a localized epizootic in sage hens resulted in the recovery of *Bacterium tularense* from the tissues of dead and killed sage hens and from infesting ticks of the species *Haemaphysalis cinnabarina* (the bird tick), furnishing added evidence that gallinaceous game birds constitute a potential source of human infection.

"It was not evident whether *B. tularense* was the cause of the epizootic or a secondary or incidental factor. However, a comparison of data secured from both within and without the affected area has shown that sage hens from within were much more heavily tick infested; they were the only ones shown to be carrying infected ticks; and that a higher percentage of the sage hens themselves were tularemia infected. The evidence secured suggests that *H. cinnabarina*, a tick not previously incriminated, is a natural carrier of tularemia. Reports were included of a tularemia case infected from quail, of two cases in which there was a possibility that infection was from quail, and of a possible case from dressing a sage hen."

Gas gangrene of bovines [trans. title], M. A. DE SOUZA (*Rev. Zootech. e Vet. [Brazil], 17 (1931), No. 1, pp. 57–63; Eng. abs., p. 63*).—An outbreak of malignant edema is described for the first time from Brazil. Eleven strains of the isolated germ were neutralized by antigangrene serum. Monovalent bovine and rabbit serum obtained from the isolated organism protected guinea pigs against *Vibrio septicus*, the experimental work and bacteriological and serological observations having proved that *V. septicus* was the organism involved.

Bacterial flora of the intestinal tube of normal young lambs, E. A. Tunnicliff (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 4, pp. 615–624*).—This is a report of a bacteriological study made at the Montana Experiment Station of the duodenal, jejunal, ileac, cecal, and colic portions of the intestinal tube of normal shed lambs during the 1930 and 1931 lambing seasons. The ages of the nine lambs included in this study varied from 15 to 74 hours. Only healthy lambs were used. Death was produced by chloroforming. Cultures were taken immediately after death.

"The intestinal flora of very young lambs, within the first 3 days of life, included very few species, and the same groups of organisms were present in all lambs. All organisms encountered under aerobic cultivation on Endo's and hormone agar were of the genus Escherichia. In several instances two different species of Escherichia were identified from the intestine of the same lamb. Under anaerobic methods of cultivation only three types of organisms developed. One of these, a microaerophilic Gram-positive diplococcus, was present in all intestines. *C[lostridium] welchii* occurred in one or more portions of the intestines in every case. *C. tertius* was found in two lambs. With comparable dilutions and inoculum used in plating directly from the intestinal contents of six lambs in 1931, the results show the duodenum comparatively free of aerobes. More bacteria were found in the jejunum, and a still greater number were found in the ileum and cecum."

Anemia in young pigs, L. P. Doyle (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 3, pp. 356–360*).—Experiments at the Indiana Experiment Station (E. S. R., 66, p. 668) led to the conclusion that if pigs are given easy access to bluegrass sod, beginning within the first week after birth, they will usually be amply protected against anemia. Access to soil alone also provides considerable protection against the disease. It is pointed out that there is probably no peculiar merit in bluegrass sod as compared with other sod of equal palatability. Green feed free from soil, when fed to the sow and pigs, failed, however, to show any preventive effect on anemia in pigs.

Infectious diarrhea of pigs treated with serum, IV [trans. title], **H. Holth** (*Norsk Vet. Tidsskr., 43 (1931), No. 8, pp. 215–250; Eng. abs., pp. 249, 250*).—In investigations extending over a number of years the author has found *Bacillus coli* to play an important part in enteritis of newborn and older pigs. Treatment with a *B. coli* serum either alone or mixed with equal parts of Pasteurella serum was found by the author to give quite satisfactory results. The serum acts best as a prophylactic but has some value as a curative measure.

The occurrence of Bacillus rhusiopathiae suis in Brazil [trans. title], **T. de Mello and M. A. de Souza** (*Rev. Zootech. e Vet. [Brazil], 17 (1931), No. 1, pp. 41–47; Eng. abs., p. 47*).—The authors record the isolation of the causative organism of swine erysipelas from a pig for the first time in Brazil.

The life cycle of Stephanurus dentatus Deising, 1839, the kidney worm of pigs, with observations on its economic importance in Australia and suggestions for its control, I. C. Ross and G. Kauzal (*Aust. Council Sci. and Indus. Research Bul. 58 (1932), pp. 80, figs. 20*).—Following an introduction, the authors deal with the distribution and economic importance of *S. dentatus* in Australia (pp. 10–14), preparasitic stages in the life cycle (pp. 14–42), the parasitic life cycle (pp. 42–66), and control measures and eradication (pp. 66–71).

Laidlaw-Dunkin concentrated antibody (hyper-immune serum) in the treatment of naturally-occurring canine distemper, J. G. Wright (*Vet. Rec., 12 (1932), No. 16, pp. 431–442, figs. 29*).—In studies conducted, the details of which are here presented mainly in case report charts, the author has found

the Laidlaw-Dunkin concentrated antibody to be of very great value in the treatment of canine distemper provided it is used within seven days of the onset of symptoms, and that it is efficient in protecting animals against the disease when infection occurs immediately after its use. When symptoms of the disease have been in existence for longer than seven days the larger proportion of the evidence on the cases studied shows that it does not materially affect the course of the disease, although in two cases a spectacular recovery occurred after its use.

[Report of work in avian pathology], J. B. LENTZ ET AL. (*Massachusetts Sta. Bul. 280 (1932), pp. 239–242*).—Reference is made (E. S. R., 65, p. 375) to the Poultry Disease Elimination Law and to investigations of pullorum disease, by H. Van Roekel, K. L. Bullis, O. S. Flint, and M. K. Clarke; so-called "crazy chicks," by G. L. Dunlap; infectious laryngotracheitis and bronchitis and the feeding of moldy corn, by C. S. Gibbs; and avian paralysis, by Gibbs and Dunlap.

[Work in animal pathology] (*Missouri Sta. Bul. 310 (1932), pp. 58, 59*).—Work with blackhead in turkeys and leukemia in fowls (including a tabulation of the blood count of 39 Barred Rock females), by A. J. Durant and H. C. McDougle, is briefly noted.

Susceptibility of chickens to brucelliasis, H. VAN ROEKEL, K. L. BULLIS, O. S. FLINT, and M. K. CLARKE (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 4, pp. 641, 642*).—Observations at the Massachusetts Experiment Station show that natural Brucella infection in chickens in that State appears to be of little, if any, significance. Agglutinins were produced when birds were fed and inoculated with saline suspensions of the organism. Repeated doses of the antigen were tolerated without producing death.

Criteria and methods in the investigation of avian coccidiosis, E. E. TYZZER (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 3, pp. 474–483; also in Science, 75 (1932), No. 1943, pp. 324–328*).—In this contribution the author reviews some of the methods employed in previous work, and discusses certain criteria which have been found to have application in the recent investigation carried on by Tyzzer, Theiler, and Jones (E. S. R., 67, p. 319).

The effect of physical and chemical agents on the oocysts of Eimeria tenella, F. FISH (*Science, 73 (1931), No. 1889, pp. 292, 293*).—A preliminary report of the work noted below.

Some factors in the control of coccidiosis of poultry, F. F. FISH (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 4, pp. 543–559, figs. 2*).—The author points out (E. S. R., 67, p. 74) that "damage by poultry coccidiosis is not confined to the acute cases, and is greater, economically, as a cause of stunted and permanently weakened birds.

"The oocysts of *Eimeria tenella*, and presumably all other species of chicken coccidia, do not appear to be so resistant as is commonly believed. They are highly resistant to chemicals but are very susceptible to physical agents. Both segmented and unsegmented oocysts of *E. tenella* are killed at 55° C. in 10 minutes. The segmented oocysts are not significantly more resistant to heat than are the unsegmented oocysts. Mortality of oocysts by heat is directly proportional to the degree of heat used. Exposure for 20 seconds to 60° and for 3 seconds to 80° will kill both the segmented and the unsegmented oocysts. The fact that oocysts will not develop within the body of warm-blooded hosts is probably due to the body temperature and not to the lack of oxygen. Neither the segmented nor the unsegmented oocyst is very resistant to ultra-violet rays. The segmented oocyst is more resistant than is the unsegmented. Two zinc sulfide units of ultra-violet rays are sufficient to kill both segmented and nonsegmented oocysts.

"The self-limitation of the life cycle of the parasite in the host and the general vigor of the host seem more important in controlling the disease than does the possibility of the development of a specific immunity. In preventing coccidiosis, more attention should be given to the localities which furnish ideal places for the sporulation of the oocyst."

Studies on coccidiosis.—II, The effects of coccidiosis upon the weights of chickens artificially inoculated during the thirteenth and fourteenth weeks, R. L. Mayhew (*Poultry Sci., 11 (1932), No. 2, pp. 102–105, figs. 2*).—In continuation of earlier work at the Louisiana Experiment Stations (E. S. R., 66, p. 774), the author has found that chickens severely infected with coccidiosis at 12 or 13 weeks of age do not recover their loss in weight, that is become equal in weight to the controls, during the following 9 or 10 weeks. The results seem to indicate that chickens become as severely or even more severely affected when inoculated at 12 or 13 weeks of age as they do when inoculated at 7 weeks.

The pathogenesis of neuro-lymphomatosis gallinarum and similar forms of "fowl paralysis," H. P. Bayon (*Vet. Rec., 12 (1932), No. 17, pp. 457–467, figs. 8*).—In studies conducted in Cambridge, England, the author found neurolymphomatosis to occur more frequently in the progeny of fowls of some definite strain, whose chicks in early life or during the growing period had not been fed with sufficient palatable green food.

It is concluded that "where following the recognition of neurolymphomatosis in some fowls the mortality of the remainder rises superior to 10 per cent of the stock liable to disease in 4 to 6 months, it is to be suspected that some complicating disease or parasitic infestation is present. Even where neurolymphomatosis has developed in a strain, notwithstanding the presence of wholesome green feed, then the mortality due to paralysis does not rise above 5 to 7 per cent. Neurolymphomatosis is not easily communicable, and whilst frequently aggravated by the presence of different parasites, such as coccidia, cestodes, etc., yet can develop without their aid. Similarly, the lack of vitamin A and possibly also C, particularly at an early stage, influences the development of neurolymphomatosis, but can not cause it. Treatment and prevention based on what has been learned about the pathogenesis of neurolymphomatosis has enabled the disease both to be cured in some cases and prevented in others. Whilst the majority of the fowls which develop neurolymphomatosis are undersized for their age, and whilst the presence of spastic paralysis and an infiltrated iris must awaken suspicion as to the nature of the disease, yet the differential diagnosis between the various ailments which may simulate neurolymphomatosis requires specialized microscopical examination."

Immunization against fowl-pox, J. S. Glover (*Ontario Vet. Col. Rpt. 1930, pp. 79–84*).—This is a report upon the Johnson stick method of vaccination against fowl pox (E. S. R., 62, p. 473) as tested in the summer and fall of 1930. It was found that if the ground scab is virulent and freshly mixed with sterile water it will result in a definite "take" in susceptible birds, this being most in evidence at about two weeks after vaccination. If vaccinated a month before the birds are expected to come into laying, little systemic disturbance occurs. Vaccination of laying birds resulted in a decided decrease in egg production which persisted for some considerable time. Vaccination by this method had no effect upon the production of agglutinins in carriers of pullorum disease. It is concluded that the transference of fowl pox from vaccinated to unvaccinated birds does not commonly occur. The first and second crop scabs were found to be equally virulent.

Studies of the etiology of laryngotracheitis (infectious bronchitis) of chickens, J. R. BEACH (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 3, pp. 496–504*).—This is a brief account of studies conducted by the author, the details of which are included in the contributions previously noted (E. S. R., 66, p. 669).

Observations on prolapse (blow-outs), H. J. STAFSETH, W. W. THOMPSON, and C. G. GREY (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 1, pp. 80–86; abs. in Michigan Sta. Quart. Bul., 14 (1932), No. 4, p. 295*).—This is a report of work conducted with a view to determining the cause of prolapse and allied ailments of chickens such as so-called blow-outs and pick-outs. In the examination of 86 adult birds and 20 chicks, 50 per cent were found infested with roundworms and 13 per cent with tapeworms. Marked intestinal inflammation was found in 45 per cent of the birds. Observations showed that continued straining is a common manifestation in birds just prior to prolapse or eversion of the cloaca, and that prolapse of the cloaca and the oviduct is more common than prolapse of the oviduct alone. Attempts at finding a microbe that might be responsible for this malady failed. It also seems unlikely that it is of nutritional origin, since all efforts at reproducing it artificially by changes in the ration have met with failure. At present it seems as if intestinal inflammation, resulting in irritation and straining may be responsible for some of this trouble. In one flock almost immediate elimination seemed to result from treatment with Iodine Vermicide, which was given to remove roundworms and tapeworms thought to be responsible for intestinal inflammation prevalent in this flock.

Pullorum disease in poults, R. P. TITTSLER (*Poultry Sci., 11 (1932), No. 2, pp. 78–80*).—In this contribution from the Pennsylvania Experiment Station the author reports upon an outbreak of pullorum disease in 1930 in a flock with about 300 poults in the diseased group, in which the mortality was about 20 per cent. It appears quite evident from this study, and from the reports of others, that poults are susceptible to pullorum disease, and that the clinical symptoms, pathological manifestations, and biochemical nature of the organisms are identical with those found in chicks.

The relation of agglutination reaction to Salmonella pullorum infection in hens, and observations on the diagnostic efficiency of test methods, H. BUNYEA and W. J. HALL (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 3, pp. 491–496, figs. 2*).—The authors report that examinations made of 206 hens by the tube agglutination test and by the stained-antigen, rapid, whole-blood agglutination test for pullorum disease showed an agreement of 91 per cent between the two. "The tube method showed 143 reactors, of which 114 fowls (80 per cent) at autopsy yielded *S. pullorum* from their ovaries. The stained-antigen, rapid, whole-blood method showed 135 reactors, of which 112 fowls (83 per cent) at autopsy yielded *S. pullorum* from their ovaries. Of the reactors whose ovaries were shown to harbor *S. pullorum*, 75.4 per cent had active ovaries, and 24.6 per cent had inactive ovaries at the time of slaughter. Of the reactors yielding *S. pullorum* in their ovaries, 11.4 per cent showed no gross pathological lesions of the ovary. Of all reactors autopsied, 10 per cent failed to show gross lesions or the presence of *S. pullorum* in their ovaries. Of all reactors autopsied, 2.7 per cent demonstrated gross pathological lesions but did not yield *S. pullorum* in their ovaries."

Bacterial endotoxin: Search for a specific intracellular toxin in S. pullorum, J. H. HANKS and L. F. RETTGER (*Jour. Immunol., 22 (1932), No. 4, pp. 283–314, fig. 1*).—The authors find that the cell bodies of *S[almonella] pullorum* cultures contain, and by appropriate extraction methods yield, a relatively heat-resistant poison which is highly toxic for rabbits and is capable of killing guinea pigs and mice. This toxin does not cause loss of weight or

other noticeable symptoms of illness in chicks, regardless of the route by which introduced.

"The toxic principle was fairly stable in hydrogen-ion concentrations ranging from pH 3 to 12 and did not deteriorate during exposure to direct sunlight for 24 hours. It was destroyed by the prolonged action of trypsin or pepsin. It was not dializable through parchment bags, and could be precipitated with ammonium sulfate or acetic acid alcohol. The severity of the reaction caused by the toxin of *S. pullorum*, when introduced into the skin of normal rabbits, correlated with the toxicity of the same preparation for mice. The repeated injection of culture filtrate or of cellular antigen into rabbits gave rise to specific agglutinin antibodies and to a nonspecific cutaneous hypersensitiveness. Immunization with toxin filtrate induced tolerance to the toxin, but did not afford protection against subsequent infection with live culture.

"It was impossible to demonstrate that growth or toxin production is materially increased under tensions of CO_2 and O_2 which approximate those of animal tissues. Pullorum disease appears to be a septicemia rather than a toxemia."

A note on the keeping quality of Salmonella pullorum antigen, J. Biely (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 4, pp. 634–636*).—The author reports that an antigen which was 3 years 7 months old, having been kept at ice box temperature, was as sensitive for the detection of *S. pullorum* carriers as two fresh lots of antigen 7 days and 1 day old, respectively. The old and new antigens were prepared by the same method, and the same technic was used in the diagnosis of the sera.

Studies in incubator hygiene.—I, Formalin fumigation, R. Graham and V. M. Michael (*Poultry Sci., 11 (1932), No. 2, pp. 110–116, figs. 3*).—The authors found 20 cc of formalin per 100 cu. ft. of incubator space evaporated from cheesecloth and 35 cc formalin plus 17.5 g potassium permanganate per 100 cu. ft. of incubator space to kill consistently *Salmonella pullorum* on eggshells and cotton swabs exposed on the inside of an improvised door of a Buckeye mammoth incubator when the wet bulb reading was 90° F. or more. The time required was less than 1 hour. No difference in germicidal results was noted with opened or closed ventilators. The location of *S. pullorum* contaminated material in the incubator greatly influenced the length of time required by formalin to kill *S. pullorum*. *S. pullorum* on eggshells exposed in open Petri dishes on the floor of the incubator was killed in an average time of 30 minutes, but on cotton squares in open shell vials occasionally survived 2 hours. *S. pullorum* on the down and feet of newly hatched chicks occasionally survived 2 hours, suggesting the practical advantage of keeping the incubator closed for a longer period than 2 hours.

Formaldehyde fumigation of chicks at hatching time (as recommended by incubator manufacturers) apparently produced respiratory distress of a temporary character in some chicks. However, chick mortality traceable to fumigation was not significant, and the loss was probably more than counterbalanced by benefits derived from checking the spread of *S. pullorum* from newly hatched chicks to healthy chicks. The irritating effect of formalin was not observed in all hatches.

Newly hatched chicks fumigated by the cheesecloth method (2 releases at 12-hour intervals) appeared less affected by the fumigant than chicks fumigated 3 times by the potassium permanganate method.

Formolized cheesecloth (20 cc. per 100 cu. ft. of incubator space) killed *S. pullorum* on artificially contaminated eggshells, cotton squares, and newly hatched chicks quite as efficiently as the potassium permanganate method. In

fact, slight germicidal advantages were observed with formolized cheesecloth, notwithstanding the fact that the amount of formalin released in a single fumigation was only 57 per cent of the amount used by the permanganate method. Less than 50 per cent of the amount of formalin was required in the 2 releases as compared with the 3 of the potassium permanganate method.

The control of avian tuberculosis, T. S. Rich (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 3, pp. 386–394*).—A discussion of the progress of control work under way in the United States.

The effects, treatment, and prevention of worm infestation in poultry, H. J. Stafseth and W. W. Thompson (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 3, pp. 467–473; abs. in Michigan Sta. Quart. Bul., 14 (1932), No. 4, pp. 295, 296*).—This contribution from the Michigan Experiment Station deals with tapeworms and ascarids, including the effects of worm infestation, treatment, and prevention.

Parasites of wild birds in Quebec, J. A. Rayner (*Sci. Agr., 12 (1932), No. 5, pp. 307–309*).—A list is given of the external and one of the internal parasites taken from wild birds collected during June, July, and August of 1930 in the Province of Quebec.

Life history of the rabbit stomach worm, Obeliscoides cuniculi, J. E. Alicata (*Jour. Agr. Research [U. S.], 44 (1932), No. 5, pp. 401–419, figs. 12*).—This is a report of an investigation undertaken principally for the purpose of discovering facts in the preparasitic development of *O. cuniculi* that might lead to practical methods of controlling this parasite in rabbitries.

It is found that "in common with those of other strongyles the free-living larvae of *O. cuniculi* undergo two molts in fairly rapid succession. In charcoal cultures and at room temperatures the infective stage is reached in about 6 days. The infective larvae failed to produce skin lesions and subsequent infestations when placed on the intact skin of live rabbits. These larvae were incapable of burrowing into the skin of young rats under experimental conditions. Infective larvae were found to withstand a temperature of 2 to −4° C. for 30 days, but the vitality of most of them was destroyed after being kept at a temperature of −18° for 3 days. The infective larvae did not appear to be very resistant to desiccation, as all of them were found dead after a 5-hour exposure to air drying at room temperature. The infective larvae responded positively to diffuse daylight but were repelled by strong artificial light. In the presence of a 1 per cent solution of basic fuchsin, the infective larvae did not exsheath and remained active in the stain for a period of 18 hours. Most of the infective larvae reached sexual maturity in the stomach of rabbits in 16 to 20 days.

"Post-mortem examination of experimentally infected rabbits, within about a month after the larvae were fed by mouth, usually revealed areas of inflammation in the gastric mucosa and the presence of petechial hemorrhages and blood clots on the stomach wall. The worms were found free on the mucosa or embedded in the stomach wall. The larvae undergo two molts in the stomach of the rabbit before attaining sexual maturity, the worms become sexually differentiated after the third molt, but the bursa is not fully developed until the fourth or final sheath has been cast off. In several instances infective larvae were found to reach sexual maturity in the stomach of guinea pigs; in such cases the eggs developed normally and the larvae reached the infective stage after undergoing the usual two molts. The time required for Obeliscoides larvae to reach the egg-laying stage in the guinea pigs was about the same as in the rabbits."

A list of 19 references to the literature is included.

AGRICULTURAL ENGINEERING

Report of committee on engineering experiment stations, Association of Land-Grant Colleges and Universities, at meeting of engineering section in Chicago, November, 1931, C. A. LORY ET AL. (*Assoc. Land-Grant Cols. and Univs., Engin. Expt. Sta. Rec., 12 (1932), No. 1, pp. 6–8; also in Assoc. Land-Grant Cols. and Univs. Proc., 45 (1931), pp. 351–355*).—The data presented show that in 1931 there was a total of 40 engineering experiment stations in the United States receiving legislative appropriations of $108,450, college allotments of $624,720, and financial support from other sources aggregating $609,630. These stations employed a full-time personnel of 184, a paid part-time personnel of 283, and an unpaid part-time personnel of 315. The financial support represented an increase over the previous year of nearly one-fourth of a million dollars, but the total personnel decreased by 49.

[Agricultural engineering investigations at the Iowa Station], J. B. DAVIDSON, E. V. COLLINS, W. G. MURRAY, H. GIESE, L. W. FORMAN, C. Y. CANNON, E. N. HANSEN, and E. V. COLLINS (*Iowa Sta. Rpt. 1931, pp. 17–22, 31, 32, fig. 1*).—The progress results are presented of studies on tractor cultivators, planters, and disk hillers in corn production, farm building losses due to wind and fire, the all-masonry barn, farm refrigeration, tractor track efficiency, draft of plows, silo wall treatments, prepared roofing, limestone and fertilizer distributors, efficiency of a barn ventilation system, and the comparative efficiencies of a modified ensilage cutter and a hay fork for storing hay.

[Agricultural engineering investigations at the Missouri Station], J. C. WOOLEY ET AL. (*Missouri Sta. Bul. 310 (1932), pp. 8, 9, 10, 11*).—The progress results are presented of studies on terracing machinery, grain harvesting, grain drying, tractor costs, relation of silage density to depth, electric brooding, the durability of fence posts, and the average replacement costs of farm buildings.

[Agricultural engineering investigations at the Massachusetts Station], C. I. GUNNESS (*Massachusetts Sta. Bul. 280 (1932), p. 195*).—The progress results of experiments with apple storages, fertilizer distributors, and low-lift pumps are briefly reported.

Surface water supply of the United States, 1929, VI (*U. S. Geol. Survey, Water-Supply Paper 686 (1932), pp. IX+290, fig. 1*).—This report, prepared in cooperation with the States of Montana, Wyoming, Colorado, Missouri, and Kansas, presents the measurements of flow made on streams in the Missouri River Basin during the year ended September 30, 1929.

Water survey of Cimarron County, Oklahoma, H. W. HOUGHTON (*[Oklahoma] Panhandle Sta., Panhandle Bul. 38 (1932), pp. 29, pl. 1, fig. 1*).—The results of a survey of the water resources of Cimarron County, Okla., are presented and discussed. The data indicate that a majority of the wells of the county yield water which is suitable for irrigation purposes.

Flood-water farming, K. BRYAN (*Geogr. Rev., 19 (1929), No. 3, pp. 444–456, figs. 9*).—In a contribution from Harvard University, results of a general study are briefly summarized on the geographical relationships of the practice of flood-water farming. Consideration also is given to the decline in acreage in relation to recent changes in stream channels. No specific conclusions are drawn.

[Irrigation investigations at the Nevada Station], G. HARDMAN, R. STEWART, and F. L. BIXBY (*Nevada Sta. Rpt. 1931, pp. 15, 16*).—The progress results are presented of studies on the reclamation of certain desert soils under irrigation from artesian wells in the Las Vegas Valley of southern Nevada, which

deal specifically with water supply, the relation between precipitation on adjacent watersheds and the underground water supply, and the reclamation and improvement by the use of fertilizers of different soils.

Irrigation experiments (*Canada Expt. Farms, Lethbridge (Alta.) Sta. Rpt. Supt. 1930, pp. 39–42, fig. 1*).—Data are presented on the irrigation requirements of crops over a period of three years, with particular reference to alfalfa, wheat, potatoes, and sugar beets.

Selecting the pump, power, and piping for irrigation purposes, O. E. ROBEY (*Michigan Sta. Quart. Bul., 14 (1932), No. 4, pp. 247–253, figs. 3*).—Tabular and graphic data are presented indicating the pump, power, and piping required for different irrigation purposes.

Irrigation pumping plants, M. R. KULP (*Idaho Sta. Circ. 66 (1931), pp. 23, figs. 6*).—Practical information is given on the installation and operation of farm pumping plants for irrigation purposes where it is necessary to furnish emergency supplies of water.

Saving surface soil and preventing erosion, L. R. TAFT (*Michigan Sta. Quart. Bul., 14 (1932), No. 4, pp. 237–244, figs. 6*).—Practical information is presented on erosion prevention in Michigan orchards, special attention being devoted to terracing methods, repairing washouts and gullies, and the use of dams.

Public Roads, [April and May, 1932] (*U. S. Dept. Agr., Public Roads, 13 (1932), Nos. 2, pp. 21–40+[2], figs. 4; 3, pp. 41–56+[1], figs. 14*).—These numbers of this periodical report the current status of Federal-aid road construction as of March 31 and April 30, 1932, respectively. No. 2 also contains data on motor-vehicle registrations, registration fees, licenses, permits, fines, etc., 1931, and the following articles: Where the Highway Dollar Goes, by J. L. Harrison (pp. 21–31); and The Resistance of Concrete to Frost Action, by F. H. Jackson and G. Werner (pp. 32–38). No. 3 contains a list of publications of the Bureau of Public Roads, and the following articles: Highway Traffic Capacity, by A. N. Johnson (pp. 41–46); and Concrete Pavement Design Features, 1931, by R. D. Brown (pp. 47–52).

A practical method for the selection of foundations based on fundamental research in soil mechanics, W. S. HOUSEL (*Mich. Univ., Engin. Research Bul. 13 (1929), pp. 117, pls. 2, figs. 44*).—This bulletin presents a method for determining the bearing capacity of foundations for spread footings in a cohesive and plastic material which is based on a fundamental analysis of the problem. While the theory presented may be fundamental, and thus general for all types of cohesive material, supporting data from extensive tests are presented only for that type of material that is usually classified as a plastic solid.

It was found that the physical properties which govern the bearing capacity of a cohesive or plastic soil such as clay may be determined by a comparatively simple test procedure. It appears that bearing capacity tests properly analyzed yield the necessary data for the design of substructures, such as spread footings, and furnish an accurate and practical method for the solution of such problems.

The procedure is divided into several steps. The first step consists of bearing capacity tests on two or more bearing areas differing in size. The second is the determination of two factors of bearing capacity by straight-line equations resulting from the analysis of the load-settlement diagrams for varying amounts of settlement. The third step is the determination of two physical characteristic coefficients from the relations shown by a general equation for bearing capacity, and the fourth is the selection of the bearing capacity limit and the allowable bearing capacity from the curve of physical characteristics. The

final step is the determination of the allowable bearing capacity of any size of spread footing for the desired settlement by graphical solution of the general equation.

In the tests, the bearing capacity of soil was found to be dependent upon two separate and measurable factors, defined as perimeter shear and strength of the pressure bulb, and the straight-line relation of bearing capacity to the relative size of bearing area was formulated for equal amounts of settlement. The general relation also was established between settlement, bearing capacity, and the size and shape of bearing areas, which is independent of the time element.

The theory of pressure distribution on bearing areas, developed and checked experimentally, is quite contrary to some accepted conceptions of pressure distribution and indicates the advisability of revising the present methods used in the design of footings.

The experimental data from an extensive investigation to determine the physical characteristics of a plastic soil also are presented in complete form. In this connection an appendix is included on the development of the physical characteristics ratio, which is an attempt to furnish a more complete interpretation of the physical characteristics coefficients by developing relations between these quantities and the laws of elastic solids and viscous liquids.

Effect of calcium chloride as an admixture in Portland cement concrete, R. C. Sloane, W. J. McCaughey, W. D. Foster, and C. Shreve (*Ohio State Univ. Engin. Expt. Sta. Bul. 61 (1931), pp. V+81, figs. 31*).—Results of studies are reported which showed that calcium chloride retards the hydration of tricalcium aluminate and tends to keep the hydrated material in an amorphous or finely crystalline condition. It accelerates the hydration of the tricalcium silicate and slightly accelerates the hydration of the beta dicalcium silicate. Calcium chloride accelerates the hydration of Portland cement up to 3 days, and after about 30 days, and is partly used up in the hydration of cement. It tends to make a silica gel, such as coats a partially hydrated cement grain, much less permeable, and is positively adsorbed by the cement grains.

When cured in air, mortars treated with calcium chloride lose less water than plain mortars. Concrete treated with calcium chloride shrinks more than plain concrete from the first to the tenth day.

Moisture: Its influence on the heat conductivity of building materials, A. A. Berestneff (*Heating and Ventilating, 29 (1932), No. 4, pp. 27–32, figs. 7*).—Data are reported leading to the conclusion that all tables for coefficients of heat conductivity of structural materials should also indicate the moisture content at which the conductivity values were established. It has been found that a high moisture content may increase and even double the heat losses, as indicated by the coefficients now in use.

Moisture penetration in exterior walls, H. A. Gray (*Jour. Boston Soc. Civ. Engin., 19 (1932), No. 3, pp. 110–136*).—Data are presented from an investigation of the factors affecting the construction of a satisfactory exterior masonry wall, including only those portions of the wall which are above ground. No conclusions are drawn, but a large number of practical suggestions are presented.

Atmospheric corrosion of metals, J. C. Hudson (*Faraday Soc. Trans., 25 (1929), No. 5, pp. 177–252, figs. 20*).—This report deals essentially with the results of field tests on the atmospheric corrosion of 16 different nonferrous metals and alloys, including copper, arsenical copper, cadmium-copper, tin bronze, aluminum bronze, brass, nickel, pure and commercial zinc, a nickel-chromium alloy, copper-nickel alloys, and lead. The metals were exposed in the form of plates and of wire at five experimental stations representative of various

types of atmosphere. The corrosion was measured by three independent methods, which were based on (1) determinations of the increase in weight of specimens exposed in Stevenson screens, (2) of the increase in the electrical resistance of fully exposed specimens, and (3) of the loss in weight of fully exposed plate specimens.

In the weight increment tests of the 12 materials exposed, copper, cadmium-copper, arsenical copper, tin bronze, and aluminum bronze gave the smallest weight increments. The results indicated that there is a critical humidity for each metal, determined by the vapor pressure of its corrosion product, above which condensation will occur on its surface. This critical humidity varies for different metals and appears to approach saturation in the case of aluminum, copper, and possibly also iron.

In the electrical resistance tests, the resistance changes observed over a period of exposure of one year ranged from 0.05 per cent for nickel-chromium to 6.01 per cent for so-called compo wire. The nickel-chromium and tin bronze suffered the smallest increase in electrical resistance. In the weight-loss tests, nickel-chromium was the least corroded material after exposure for a year.

The chief conclusion from the results in general is that the materials tested are not appreciably corroded when exposed to the atmosphere under normal conditions. The provisional conclusion is drawn that in the majority of cases of these metals corrosion will be at most directly proportional to time. In general, the rate of corrosion was much greater for fully exposed specimens than for specimens exposed in a Stevenson screen. The results of the resistance tests gave higher values for the corrosion of these metals than the corresponding loss in weight tests.

Standards and specifications for nonmetallic minerals and their products, J. Q. CANNON, JR. (*U. S. Dept. Com., Bur. Standards Misc. Pub. 110* (*1930*), *pp. IX+680, figs. 243*).—Standards and specifications are included for such minerals of agricultural engineering interest as fuel and illuminating oils, including gasoline and kerosene; lubricating, cylinder, and machine oils; lubricating greases; and cement and concrete.

Fuel briquettes from southern pine sawdust, C. A. BASORE (*Ala. Polytech. Inst., Engin. Expt. Sta. Bul. 1* (*1930*), *pp. 28, figs. 7*).—The results of studies of a process for the manufacture of sawdust briquets from waste wood are presented and a resulting process which produces a high grade fuel briquet from southern pine sawdust at a moderate cost is described. These briquets have been shown to possess many qualities which should make them desirable as a low ash, free burning fuel for domestic purposes, and as a substitute for cord wood. In the process the sawdust is preheated to destroy the elasticity of the wood and to eliminate moisture and combined oxygen and hydrogen. The weight is thus decreased about one-third and the heating value per pound almost doubled. The preheated sawdust is then moistened and briquetted hot without the addition of a binder.

The volatility of motor fuels, G. G. BROWN (*Mich. Univ., Engin. Research Bul. 14* (*1930*), *pp.* [*VIII*]+*299, figs. 110*).—Detailed studies regarding the effect of fuel volatility on the performance of internal-combustion engines are reported. The details of the technic involved in the studies are described. The studies themselves dealt with equilibrium volatility of motor and aviation fuels; ease of starting; effective volatility under operating conditions; the relation between atmospheric temperature, volatility, and acceleration performance; and vapor pressure and vapor lock.

The results in general indicate that the ease with which an internal-combustion engine will start, the length of time required to warm it up, and the

character of its performance are almost wholly dependent upon the volatility of the fuel, as indicated by the distillation curve of the American Society for Testing Materials. The 10 per cent point is related to the lowest engine temperature at which satisfactory starting may be obtained and the lowest mixture temperature at which the engine may be operated. The 35 per cent point is related to *the lowest mixture temperature at which satisfactory performance may be obtained* during the warming up period and therefore determines the length of time necessary to warm up the engine. The 65 per cent point is related to the lowest mixture temperature at which perfect performance can be obtained. For these reasons the 10, 35, and 65 per cent points should be low to insure satisfactory starting, warming up, and general performance. The 90 per cent point, however, should not be so low as to indicate a dry mixture, for this means loss in power or acceleration. The vapor pressure of the fuel, or the 10 per cent point, should not be so low as to indicate trouble from vapor lock.

It was found in the study of the relation between atmospheric temperature, volatility, and acceleration performance that that part of the distillation curve from 65 to 100 per cent is of little or no practical importance in determining effective volatility in modern engines, provided the 90 per cent point is not so high as to prevent efficient combustion of the fuel nor so low as to supply a practically dry mixture. The first 35 or 40 per cent of the distillation curve is the controlling factor in determining fairly satisfactory performance during the warming up period, providing the conditions stated concerning the 90 per cent point are fulfilled.

Appendixes are included which present data on the relation between volatility and knock rating and the determination of the American Society for Testing Materials distillation curve of blends from the distillation data of the two blending materials.

Mineral oils and lubrication, W. KAY (*Jour. Soc. Chem. Indus., Chem. and Indus., 50 (1931), No. 33, pp. 691–696*).—The author summarizes data from various sources on the uses and applications of the different grades of lubricating oils and on the choice of lubricants and the making of specifications. Special attention is devoted to the necessary chemical and physical tests for controlling the quality of oil supplies.

The carbonisation of lubricating oils, H. N. BASSETT (*Jour. Soc. Chem. Indus., Chem. and Indus., 50 (1931), No. 26, pp. 527–529*).—A summary is presented of the results of studies from various sources on the carbonization of lubricating oils in internal-combustion engines. The conclusion is that a test is still lacking which will give a really satisfactory basis for estimating the residue which may be expected from lubricating oils when oxidized under conditions existing in an internal-combustion engine. In this connection the opinion is that the Conradson test is more useful as an indication of the type of oil under consideration than of the carbon deposit which may be formed.

Manifold phenomena in internal combustion engines, K. J. DEJUHASZ (*Minn. Univ., Engin. Expt. Sta. Bul. 7 (1930), pp. VI+[39], illus. 25*).—The object of the experiments reported in this bulletin was to collect data relating to the pressure phenomena attending the exhaust and intake processes in high speed internal-combustion engines and to evaluate data upon which the computation of the light spring card may be based. Actual indicator cards were taken on several engines in the laboratory under different loads and speed conditions, and the results were evaluated from different points of view.

The report also contains a survey of methods used for determining a light spring card for a given engine from the design data, and two original methods are described. By comparison of the recorded diagrams with those computed,

it is shown that the actual conditions can be determined with a fair degree of approximation. It is also made evident that the accuracy may be increased by collecting more experimental data from different types of engines. In the actual experiments, 1-, 4-, and 12-cylinder engines were used.

In the studies of the pressure variation in the intake manifold, it was found that the mean manifold pressure gives imperfect information as to the pressure conditions in the manifold. It also was found that the pressure curves given by the two Venturi agree in form but differ in magnitude, indicating that the retransformation of velocity energy is far from being complete even in the case of a comparatively well-formed carburetor Venturi. The data on intake manifold pressures at different speeds show that the highest pressure in the intake manifold occurs later in the cycle as the engine speed increases. The maximum pressure obtained also increases with the speed up to a certain point.

The data on pressure drop caused by the carburetor Venturi show that the actual pressure drop in the manifold is far greater than the calculated value corresponding to the velocity in the intake pipe, and even exceeds that corresponding to the Venturi velocity. This is taken to indicate that the retransformation of velocity into pressure, while the combustible mixture passes through the Venturi into the intake pipe, takes place with low efficiency. This means that any pressure regained is lost again owing to the change of direction of the flow in the bends and friction of the manifold walls. It is concluded that taking simultaneous pressure readings at different points along the intake manifold would furnish valuable information as to where the pressure losses occur and would give a basis for the development of more efficient manifolds.

Studies of the determination of the flow of gas through manifolds resulted in complex mathematical analyses of the different factors involved, and produced the conclusion that the carburetor Venturi, as it is used in present-day carburetors, is a velocity-pressure transformer of very low efficiency.

The results in general indicate the desirability of extending the studies to static and dynamic pressures at several points of the intake and exhaust systems of one- and multi-cylindered engines.

Wind power and power lines in agriculture, A. DECKER (*Windkraft und Überlandkraft in der Landwirtschaft. Diss., Hessische Ludwigs-Univ., Giessen, 1930, pp. [7]+108+[5], pls. 3*).—A study is reported of the comparative efficiencies and economies of wind and central station power in Germany.

It was found that in general wind power can not compete with central station power from the standpoint of unit cost of the energy alone, owing to the high cost of the equipment for the isolated plant and the maintenance thereof. The uncertainty of adequate and constant wind is also against heavy investments in equipment for the harnessing of wind power. The studies showed, for example, that regions having an average wind velocity of less than 4 m (13.12 ft.) per second can not make constant economical use of wind power except in rare cases where the cost of overhead transmission systems from a central station is prohibitive.

Data on wind conditions in Germany are presented showing that the regions most favorable for the economical use of wind power are the north and east coasts.

Experiments with farm machinery (*Canada Expt. Farms, Rpt. Dir. 1929, pp. 20, 21, fig. 1*).—Results of experiments are reported on the use of the combined corn binder and silage cutter and with weed-control machinery. It was found that the combined corn binder and silage cutter requires a fairly large acreage of corn to justify its operation, and it can not be used to ensile such crops as oats or sweetclover.

Handbook of farm machinery technic, Vol. II, No. 1, G. KÜHNE (*Handbuch der Landmaschinentechnik. Berlin: Julius Springer, 1932, vol. 2, No. 1, pp. IV+264, pl. 1, figs. 720*).—This is part 1 of the second volume of this handbook (E. S. R., 66, p. 379) of information on the technology of German agricultural machinery. It is devoted to a profusely illustrated technical discussion of harvesting, threshing, and grain cleaning and sorting machinery.

Sections are included on mowers with and without grain binding attachments; haying machinery, including tedders and rakes; potato and sugar beet digging and topping machinery; threshing machines, including combines; and machines for cleaning and grading grain and potatoes.

In connection with the potato and beet harvesting machines the results of some investigations on the more recent improvements and developments are summarized, including draft tests of beet lifters, toppers, and grubbers.

Improved placement of fertilizers in the hill for corn, R. M. SALTER, C. O. REED, E. E. BARNES, and C. L. THRASH (*Ohio Sta. Bimo. Bul. 156 (1932), pp. 83–98, figs. 6*).—This is a progress report of investigations involving both controlled hand placement experiments and field performance tests of commercial corn planter fertilizer attachments.

The hand placement experiments as a whole appeared to favor the placing of the fertilizer either in a circular band, approximately 2 in. wide and 3 in. inside diameter, or in two parallel lateral bands, each about 2 by 8 in. and separated 3 in., giving in either case a minimum horizontal distance of about 0.75 in. between the seed and the fertilizer. As regards depth the fertilizer band probably should lie within a zone from 0.75 in. above to 1 in. below the seed, the evidence being slightly in favor of the deeper placement.

Tests also were conducted with different makes of commercial corn planters to determine how various types of fertilizer depositors place fertilizer in respect to the hill of corn and the efficiency of these types as measured by stand, height, and yield of corn. The manner of placement of the fertilizer was determined by a multiple-plane method which was developed by the experiment station. Briefly this method consists of taking off a series of layers of soil 0.25 in. thick and recording what is seen on the top plane of each successive layer. The data on each planter are briefly discussed, but no conclusions are drawn.

Nature, cause, and prevention of carbonaceous dust explosions and fires, H. STEINBRECHER (*Wesen, Ursachen und Verhütung der Kohlenstaubexplosionen und Kohlenstaubbrände. Halle (Saale): Wilhelm Knapp, 1931, pp. VIII+77+[1], figs. 8*).—This book brings together the results of numerous studies from various sources relating to the nature and cause of fires and explosions of carbonaceous dusts, and gives both technical and practical information on their prevention.

The conclusion is that the explosibility of carbonaceous dust is a function of its concentration, fineness, inflammability, and speed of combustion. The content and composition of volatile constituents, the content of water and ash, and the amount and intensity of the combustible constituents also are factors of importance in explosibility. The spontaneous combustion of carbonaceous dusts also is considered to be a source of danger which is underestimated in that it may result in a serious explosion. General and special rules for the handling of carbonaceous dusts are included.

Dust explosions (*Jour. Soc. Chem. Indus., Chem. and Indus., 50 (1931), No. 31, pp. 650–653*).—This is an abstract of a lecture presented at the Home Office Industrial Museum, Westminster, covering a review of results of experiments conducted elsewhere relating to dust explosions and reporting the results of some experiments with grain dusts, particularly from grain stored in bins. It was found that bin storage of grain represented an improvement from the

standpoint of dust explosions. Tall vertical silos appeared to give the best results in this respect.

Experiments were also made to determine to what extent the top of a silo should remain open to relieve pressure in the event of an explosion, a silo 90 ft. high and 10 ft. or more in diameter being used. It was found that when the top of the silo was fully open the pressure produced by an explosion of rice meal dust was too small to be measured. When the top of the silo was open to the extent of only one-ninth, pieces of the wooden top cover were blown into the air. When the top cover was two-thirds open the pressure was less than 0.1 lb. per square inch, and when one-third open the pressure was about 7 lbs. per square inch and the explosion lasted about 0.4 second.

The conclusion was drawn that with rice meal dust in a silo it is safe to have the top cover only one-third open, since the pressure of 6 or 7 lbs. per square inch was not sufficient to damage the silo. Tests of other dusts of similar character to that of rice meal produced pressures on explosion which were less in each case than that from rice meal dust.

Housing conditions for chickens in confinement, D. C. KENNARD (*Ohio Sta. Bimo. Bul. 156 (1932), pp. 111–116, figs. 2*).—Practical information is given on the housing of chickens in confinement, with particular reference to the admission of natural daylight.

Preserving foodstuffs by quick freezing and refrigeration (*New York: Food Indus., 1931, pp. 240, figs. 125*).—This is a selection of articles reporting modern practice in the scientific and technical control of refrigeration, quick freezing, and cold storage machinery and equipment.

AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY

[Papers on agricultural economics] (*Jour. Farm Econ., 13 (1931), No. 4, pp. 505–629, figs. 4*).—Included are the following papers: Coordination of Farm Management Research in the Western States, by C. L. Holmes (pp. 505–522); The History and Objectives of Outlook Work, by H. R. Tolley (pp. 523–534); Effects of Production and the 1930 Business Depression on Farm Income, by L. H. Bean (pp. 535–546); Who Pays the Tariff Duties? by B. H. Hibbard (pp. 547–553); Farm Accounting Investigations in Switzerland, by W. J. Roth (pp. 554–572); Agricultural Credit Corporations and Their Problems, by W. H. Rowe (pp. 573–590); Marginal Land and Cotton Prices, by W. W. Ashe (pp. 591–596); Philosophy of Aereboe as Related to Scope and Method of Research in Farm Management, by H. H. Stippler (pp. 597–604); Extension Work in Relation to Land Utilization, by V. Gilman (pp. 605–611); The Relation of Economic Research Work to Other Research in the State, by P. V. Cardon (pp. 612–620); and The Feudal System in Persia, by C. B. Fisher (pp. 621–629).

[Papers presented at the twenty-second annual meeting of the American Farm Economic Association] (*Jour. Farm. Econ., 14 (1932), No. 1, pp. 2–157, figs. 16*).—Included are the following papers and discussions thereon presented at the meeting held at Washington, D. C., December 28–30, 1931: The Origin and Development of Farm Economics in the United States, by G. F. Warren (pp. 2–9); The Origin and Development of the Office of Farm Management in the U. S. Department of Agriculture, by E. H. Thomson (pp. 10–16); The Origin of Farm Economics Extension, by C. B. Smith (pp. 17–22); The Future of the General Price Level, by G. F. Warren and F. A. Pearson (pp. 23–46); The Business Cycle and Its Relation to Agriculture, by A. H. Hansen (pp. 59–67); Certain Aspects of the Outlook for American Agriculture during the Next Ten Years, by W. E. Grimes (pp. 69–80); Adjustments in Agricultural Production under the Assumption of a Lower General Price Level and Reduced Foreign

Demand for Agricultural Products during the Next Ten Years, by A. G. Black (pp. 83–92); Adjustments Necessary in Taxation in View of the Possibility of a Lower General Price Level, by E. Englund (pp. 94–105); Adjustments in Credit, by N. J. Wall (pp. 108–116); The Human Factor from the Viewpoint of Farm Management, by W. W. Wilcox (pp. 119–127); and The Human Factor from the Viewpoint of Social Relations, by T. B. Manny (pp. 128–137).

[Investigations in agricultural economics at the Iowa Station, 1930–31] (*Iowa Sta. Rpt. 1931, pp. 7–17, fig. 1*).—Results not previously noted are reported for studies as follows: Stock-share farm leasing and changes in land values, by M. Peck (pp. 7, 8, 11, 12); relationship of cash and futures prices for oats and the advantage of storing oats, by F. Robotka (p. 8); farm records and accounts for 49 Webster County farms, by J. A. Hopkins, Jr., and A. G. Black (pp. 8, 9); destination and origin of the commercial corn and oats of the State and corn price differentials in different parts of the State, by R. C. Bentley and P. L. Miller (pp. 9, 10); livestock shipments and prices, by Miller and S. H. Thompson (p. 12); movement of Iowa corn and oats, by Bentley (p. 12); direct packer buying, by Miller (pp. 12, 13); seasonal fluctuations in marketing Iowa hogs, by Miller (p. 13); farm mortgages and land values, by Black and W. G. Murray (p. 14); utilization and cost of farm power, by Black, Hopkins, A. B. Caine, and J. B. Davidson (p. 15); production costs of corn, by Black and H. L. Thomas (p. 16).

[Investigations in agricultural economics at the Missouri Station, 1930–31] (*Missouri Sta. Bul. 310 (1932), pp. 6, 7, 8*).—Included are some findings by O. R. Johnson and B. H. Frame regarding the percentages that land charges during 1925–1929 were of the costs of production of different crops and regarding the actual costs of production of different crops, by years 1920–1929. A financial statement by E. E. McLean of farm business for the year 1930 for 78 farms in northwestern Missouri included in a survey made in cooperation with the Bureau of Agricultural Economics, U. S. D. A., is also given.

[Investigations in agricultural economics at the Ohio Station] (*Ohio Sta. Bimo. Bul. 156 (1932), pp. 121–127*).—Tables and text by C. W. Hauck compare the yields and the value of tomato products, returns to growers, and labor and other costs in five Ohio tomato canneries buying tomatoes on a flat rate basis, 1925–1929, and on a grade basis in 1930. A table and text by V. R. Wertz show the tonnage of mixed and unmixed commercial feeds of different kinds reaching the retail trade in Ohio in 1929, 1930, and 1931. A table by J. I. Falconer shows the average prices and index of prices of different Ohio farm products in 1910–1914, 1925–1929, and 1931, and the index for February, 1932.

The table of index numbers of production, prices, and income by Falconer (E. S. R., 67, p. 331) is brought down through February, 1932.

Research in agricultural credit: Scope and method, edited by J. D. Black (*Social Sci. Research Council Bul. 3 (1931), pp. [4]+158*).—This is the third report of the series previously noted (E. S. R., 67, p. 179). It was prepared by a special committee composed of J. D. Black, M. R. Benedict, A. G. Black, R. C. Engberg, F. F. Hill, N. J. Wall, and D. L. Wickens, and includes contributions from research workers connected with the U. S. Department of Agriculture and other Federal departments, State universities, agricultural colleges and experiment stations, and other universities and institutions. The purposes of the report are "to outline the field from the point of view of research; to indicate its place in the general framework of economics and agricultural economics, pointing out relations to other subdivisions of the field; to outline and orient the research already done in the field; and to analyze the methodology of a number of carefully selected projects."

The field, the basic principles and concepts, the sources of information, and past research in agricultural credit are discussed. Thirty-two projects are outlined as suggested plans of attack for specific research problems, 4 being planned for an area approach, 13 for an institutional approach, 3 for a type of credit approach, and 1 for a commodity approach. Six other projects relate to particular operations or functions connected with credit, and 5 to interest rates and miscellaneous subjects.

Agricultural credit and the economic organization, N. J. WALL (*Jour. Farm Econ., 14 (1932), No. 1, pp. 138–151*).—This article was prepared as part of the introduction to the publication noted above, and discusses production and mortgage credit.

The classification of farm lands for assessment purposes in Wisconsin, L. B. KRUEGER (*Jour. Land and Pub. Util. Econ., 8 (1932), No. 2, pp. 113–125, figs. 2*).—The method of classifying farm lands in Wisconsin for assessment purposes is discussed and some suggestions are made.

Production of crops and livestock on the Newlands project, 1931, C. VENSTROM (*Nevada Sta. Bul. 127 (1932), pp. 26, figs. 4*).—The 1931 census reports of the U. S. Bureau of Reclamation are compiled and compared with previous reports (E. S. R., 66, p. 477). Some adjustments in land utilization are suggested.

Receipts and costs of Nevada range cattle ranches for the years 1928, 1929, and 1930, C. A. BRENNEN ET AL. (*Nevada Sta. Bul. 126 (1932), pp. 25, figs. 6*).—This bulletin, prepared for use in conjunction with the bulletin previously noted (E. S. R., 66, p. 681), shows the average costs and receipts, by items, for the years 1928, 1929, and 1930, and for 1930, by ranch accounts and annual statements. The 1931 situation and the important factors affecting receipts and costs are discussed. The method and procedure used in obtaining ranch costs are described.

Factors affecting the price of eggs, A. H. LINDSEY (*Massachusetts Sta. Bul. 280 (1932), p. 194*).—Some results are given as to the relation of prices of eggs and meat and the effects of quality, uniformity of color and size, weight, and number of dirty eggs on prices.

Some observations on the 1931 fluid milk marketing situation in Michigan, W. O. HEDRICK (*Michigan Sta. Quart. Bul., 14 (1932), No. 4, pp. 254–267*).—This article is based on data collected by the Milk Marketing Commission appointed by the Governor of Michigan in 1931. The marketing outlets, the marketing qualities of whole milk, the Michigan Milk Producers' Association and its regulations of milk production, milk prices to farmers and to consumers, the effects of the business depression on the milk industry, milk handling costs, dealers' competition, the milk use pay-off plan, and the limits of the Detroit milk area are discussed.

Agricultural depression and farm relief in England, 1813–1852, L. P. ADAMS (*London: P. S. King & Son, 1932, pp. XIV+191, figs. 3*).—This study under the direction of the department of economics of Cornell University describes and discusses the problems of agriculture and the relief measures proposed and enacted in England during the period.

Rural Russia under the old régime, G. T. ROBINSON (*London and New York: Longmans, Green & Co., 1932, pp. X+342, pls. 8, figs. 2*).—This is a history of rural Russia and the conditions leading up to the peasant revolution of 1917.

The 1931 flood in China (*Univ. Nanking, Col. Agr. and Forestry Bul. 1, n. ser. (1932), pp. 74, map 1*).—This is an economic survey made by the department of agricultural economics of the College of Agriculture and Forestry of the University of Nanking, in cooperation with the National Flood Relief

Commission. The cause and seriousness of the flood, the area affected and the losses, the needs of the area, the migration, illness, and deaths resulting from the flood, price changes, and relief are discussed.

International yearbook of agricultural legislation, 1929 and 1930 [trans. title] (*Inst. Internatl. Agr. [Rome], Ann. Internatl. Lég. Agr., 19 (1929), pp. XCVI+1182; 20 (1930), pp. LXXXVI+1151*).—These volumes continue the series previously noted (E. S. R., 63, p. 389).

[Investigations in rural sociology at the Missouri Station, 1930–31] (*Missouri Sta. Bul. 310 (1932), pp. 52, 53*).—Included are a brief statement of the findings in a case study by W. Burr of 59 rural families in Boone County in the investigation of rural community organization in public welfare, and a table by E. L. Morgan showing the percentage of increase in population from 1890 to 1930 in places of different sizes.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Proceedings of the forty-fifth annual convention of the Association of Land-Grant Colleges and Universities, edited by C. A. McCue (*Assoc. Land-Grant Cols. and Univs. Proc., 45 (1931), pp. 548, figs. 6*).—This is the usual report of this convention (E. S. R., 65, p. 888) held at Chicago, Ill., November 16–18, 1931, and previously discussed (E. S. R., 66, pp. 1, 99, 101). Included are the papers and discussions thereon presented at the general sessions, the sections on agriculture, engineering, and home economics, and the subsections of agriculture on resident teaching, experiment station work, and extension work. The usual reports of standing, special, joint, and research committees, lists of officers and committees, the constitution of the association, etc., are also included.

Boys' and girls' 4-H club work in the United States: A selected list of references, compiled by E. J. Webb (*U. S. Dept. Agr., Ext. Serv., Off. Coop. Ext. Work, 1932, pp. [4]+217*).—Included are references to books, periodicals, bulletins, and articles in farm papers, issued prior to 1931 and classified under the headings of general references on club work; projects and programs; leadership; demonstration methods; parliamentary practice; conferences, camps, and short courses; exhibits, contests, and premium lists; judging; games and recreation; books and reading; negro work; periodicals; farm management; home grounds beautification; and different kinds of 4-H clubs.

FOODS—HUMAN NUTRITION

The structure and composition of foods.—I, Cereals, starch, oil seeds, nuts, oils, forage plants, A. L. and K. B. Winton (*New York: John Wiley & Sons; London: Chapman & Hall, 1932, vol. 1, pp. XIV+710, figs. 274*).—This is the first of a series of three reference volumes dealing with the macroscopic and microscopic structure and chemical composition of foods. The data on chemical composition are compiled from many sources, the literature references to which are given as footnotes. The descriptions and illustrations of the macroscopic and microscopic structure are original contributions, many of them hitherto unpublished, of the authors.

A nutritional investigation with discussion of statistical interpretation, C. L. Campbell (*Jour. Amer. Dietet. Assoc., 7 (1931), No. 2, pp. 81–94, figs. 6*).—purp. discussion of the applicability of statistical treatment to data obtained research ritional research conducted by animal experimentation is based upon agricultur data from the well-known extensive investigations of Sherman and to outline a n the relative efficiency of two simple diets differing only in the the methodolo of whole milk powder and ground whole wheat.

Report of the nutrition laboratory of the home economics division, C. D. MILLER (*Hawaii Sta. Rpt. 1931, pp. 28-30*).—This report includes data on the content of vitamins A, B, C, and G in raw and bran-salted Chinese cabbage (*Brassica chinensis*); the proximate composition, value for hemoglobin regeneration, and content of vitamins A, B, C, D, and G of the shellfish opihi (*Helcioniscus exarata; H. argentatus*); the vitamin C content of Hawaiian-grown oranges; and the vitamin B content of rice-bran bread.

[Nutrition studies at the Iowa Station] (*Iowa Sta. Rpt. 1931, pp. 51, 52, 90-92, fig. 1*).—Brief progress reports are given of studies dealing with the depression of intestinal reduction by vitamin D (E. S. R., 64, p. 897) and the nature of the floridin activation of cholesterol (E. S. R., 65, p. 193), by L. Yoder; the influence of experimental technic during the preliminary depletion period on vitamin A determinations, by P. M. Nelson and P. Swanson; the vitamin A content of Prolific sweetpotatoes grown with varying fertilizer treatments, by Swanson, Nelson, and E. S. Haber; and the effects of the ingestion of fluorides on some of the constituents of the teeth, bones, blood, and tissues of albino rats, by J. A. Schulz; and hemoglobin production in rats on lean beef muscle and lean pork muscle as the sole source of protein in the diet (E. S. R., 65, p. 289), by Nelson and Swanson.

[Food utilization studies at the Massachusetts Station], C. R. FELLERS ET AL. (*Massachusetts Sta. Bul. 280 (1932), pp. 225-227, 229, 230, 232, 233*).—Progress is noted in utilization studies dealing with fruits and fruit juices, including methods of extracting and testing and the effect of microorganisms on jellying power; cranberries and cranberry products, including pectin and benzoic acid tests on different varieties, vitamin determinations and physiological studies, and chemical analyses of berries from dry and watered bogs; onions, including utilization by canning and drying and subsequent behavior of canned products; bacteriological studies of defrosted frozen foods; chemical studies on dates; and determinations of the vitamin C content of Baldwin apples and apple products and canned citrus fruits.

Some relationships involving crumb texture and color, A. E. TRELOAR, R. C. SHERWOOD, and C. H. BAILEY (*Cereal Chem., 9 (1932), No. 2, pp. 121-127, figs. 2*).—A statistical study is reported of milling and baking records of the Minnesota State Testing Mill for the crop seasons of 1921 to 1926, inclusive, undertaken in an effort to determine the relationships between the chemical composition of flours and the crumb characters in the different loaves produced under a standardized baking technic and between loaf volume and chemical characters. The flours in all cases were of a uniform unbleached straight grade of commercial production.

Loaf volumes showed a slight but positive correlation with crumb color and texture scores. This appeared to be due entirely to the mutual relationship of crumb characters with protein content, the latter being positively correlated with loaf volume.

The color and texture of the crumb showed a positive correlation with each other independent of the relationship of each to protein. The positive correlation between crumb texture and protein content held more consistently for low than high protein flours in that only low protein flours showed individual samples of poor texture. No relationship was evident between the crumb color and ash in wheat or straight grade flour, the diastatic activity of the flour, or the moisture content of the wheat.

[Methods of cooking beef] (*Missouri Sta. Bul. 310 (1932), pp. 39, 40*).—This progress report (E. S. R., 64, p. 690) discusses methods of cooking steaks from different classes of beef animals and the effect of different roasting temperatures on the palatability of beef roasts by J. A. Cline, M. E. Loughead, and B. C. Schwartz.

Nutritional properties of meat, A. G. Hogan and W. S. Ritchie (*Missouri Sta. Bul. 310 (1932), p. 5*).—Fertility records are given of three generations of rats on a diet in which muscle meat served as the sole source of protein.

Metabolism in Yucatan: A study of the Maya Indian, M. Steggerda and F. G. Benedict (*Amer. Jour. Physiol., 100 (1932), No. 2, pp. 274–284*).—This paper reports the result of the third series of basal metabolism, pulse rate, and anthropometric measurements of a group of Mayas in Yucatan (E. S. R., 65, p. 791). The present series comprises 30 subjects, 12 of whom were in the second and 7 likewise in the first study. The average heat production was 8 per cent above the prediction standards for white subjects and the average pulse rate 52 beats per minute. These findings confirm the earlier conclusions that the Mayas have a high basal metabolism and low pulse rate. Attention is called to the low metabolism of a group of 27 south Indian women as reported by Mason and Benedict (E. S. R., 66, p. 688). "This difference in metabolism can be attributed only in small part to the influence of age and sex and in somewhat larger part to the influence of environment, but the major part of the difference must be considered indicative of a real racial effect."

Metabolism during rest of the European in the Tropics, W. Radsma (*Arch. Néerland. Physiol. Homme et Anim., 16 (1931), No. 1, pp. 91–122*).—A series of basal metabolism tests is reported for a considerable number of Europeans from 20 to 23 years of age who had lived from 3 months to 2 years in the Dutch East Indies. The determinations were made with the Knipping apparatus, the earlier ones after the subjects had rested for ½ hour and the later series after the subjects had rested for 1 hour. The change was made following the discovery that in a small group of subjects considerably lower values were obtained after the 1-hour rest period than the shorter one.

When grouped according to length of time in the Tropics, the average values for 8 subjects who had been about 3 months in the Tropics were 10.57 per cent below the Benedict and 10.8 per cent below the Du Bois standards. For 7 subjects who had lived for about a year in the Tropics, the corresponding values were −4.3 and −4 per cent and for 26 subjects who had been in the Tropics for 2 years or more −3.01 and −2.88 per cent, respectively. The data for the first group were obtained after the longer rest period.

The data are discussed with reference to previous reports on metabolism in the Tropics, but the number of subjects in the present study is considered too small to draw any definite conclusions as to whether or not there is a significant lowering of the basal metabolism of Europeans in the Tropics.

A study of the diets of Federal prisoners, P. E. Howe and A. H. MacCormick (*Amer. Jour. Pub. Health, 21 (1931), No. 9, pp. 993–998*).—In this report of an investigation of the food furnished the main messes at the United States penitentiaries at Atlanta, Fort Leavenworth, Leavenworth, and McNeil Island and at the reformatory at Chillicothe, Ohio, tabulated data are presented and discussed on the nutritive values and costs of the average food consumed per man per day during various months or quarters, costs and average weight of different types of food consumed as pounds per man per day in a period of six months, and costs and average weights of selected foods consumed as pounds per man per day in the same length of time.

In general the diets were thought to furnish adequate amounts of protein, fat, carbohydrate, calcium, phosphorus, and iron, with vitamins in moderate amounts. In certain instances the calcium content was low, and in most cases the phosphorus was about twice that of the calcium. Since this proportion of calcium to phosphorus is considered not particularly desirable in domestic and laboratory animals, and since the ratio of calcium to phosphorus in milk is about 1:1, the advisability is suggested of adjusting the calcium-phosphorus ratio to this latter value by increased use of vegetables or the addition of calcium salts.

Is fat a necessary constituent of the diet? A review, M. KOEHNE (*Jour. Amer. Dietet. Assoc., 7 (1931), No. 2, pp. 110–118*).—A review of recent literature, with a list of 33 references.

Sources of nutrients chosen by women during pregnancy, lactation, and reproductive rest, C. F. SHUKERS, I. G. MACY, E. DONELSON, B. NIMS, and H. A. HUNSCHER (*Jour. Amer. Dietet. Assoc., 7 (1931), No. 3, pp. 235–251, figs. 3*).—The food intake data discussed previously (E. S. R., 66, p. 891) have been studied with reference to the percentage distribution of calories derived from each class of nutrients, and the percentage distribution of vegetables and animal protein and of calcium and phosphorus from milk, eggs, cheese, meat, fruits, vegetables, and the cereal grains.

The proportions of calories derived from protein, fat, and carbohydrate for the periods of pregnancy, lactation, and postlactation averaged for protein 15, 15, and 14 per cent, fat 39, 38, and 34, and carbohydrate 46, 47, and 52 per cent, respectively, these values falling within the limits regarded as satisfactory by Rose. The average nutritive ratios or proportions of protein calories to carbohydrate and fat calories varied between 1 to 5 and 1 to 7.2. The percentage distribution of calories among the six classes of foodstuffs for the three periods were cereals 23, 27, and 36 per cent, milk 23, 32, and 19, vegetables and fruits 14, 13, and 11, fats 15, 8, and 9, sugar 9, 8, and 11, and eggs, meat, and cheese 16, 12, and 14 per cent, respectively. In general, the values correspond favorably with those suggested by Rose for adults on a moderate income.

The individual diets showed wide variations in food selection, not only among the three subjects but at different times for the same subject. No significant differences could be noted with respect to the choice of food during pregnancy, lactation, and reproductive rest, except that "milk was relatively and absolutely a more important source of energy, protein, calcium, and phosphorus during lactation than during pregnancy or reproductive rest, a choice in accord with the criteria based upon current knowledge of nutritional principles."

The composition of growth.—II, The full-term infant, W. W. SWANSON (*Amer. Jour. Diseases Children, 43 (1932), No. 1, pp. 10–18, figs. 3*).—A comparison following the same technic as in the first study (E. S. R., 62, p. 393) is reported of the retention of minerals and nitrogen per day and per kilogram of gain in weight for two normal infants, one on breast milk and one on cow's milk (reconstituted powdered whole milk) for periods of 103 and 132 days. Both were given orange juice once a week and cod-liver oil, one teaspoonful twice a day, at 3 months of age. At about the middle of the experimental period the baby receiving breast milk was transferred to cow's milk for one week.

The gains in weight per month were 700 g for the subject receiving breast milk and 770 g for the one receiving cow's milk. The retentions of minerals and nitrogen per unit growth were considerably higher, with the exception of sulfur, in the subject on cow's milk than on the breast milk. In both the retention of calcium and phosphorus, but not of the other elements, was considerably increased by cod-liver oil feeding.

"The data presented indicate that supermineralization takes place in an infant on a food higher in concentration of salt than that intended by nature. No definite evidence is available to show that this is detrimental to the infant. The idea, however, may suggest itself that the disturbances attributed to continued feeding of whole cow's milk may be due in part to this increased mineral retention."

The iron requirement of the pre-school child, J. M. LEICHSENRING and I. H. FLOR (*Jour. Nutrition, 5 (1932), No. 2, pp. 141–146*).—Two series of iron

metabolism experiments covering 5 days each are reported for three girls and one boy from 35 to 56 months of age. On the basis of figures given in Sherman's tables, the diet in the first series of experiments was calculated to furnish 5 mg and in the second 8.5 mg of iron per day. Iron analyses of the foods used, however, gave values of 3.25 and 6.5 mg, respectively. In the first series, in which the average daily intake of iron was 3.25 mg in a diet furnishing an average of 1.266 calories, an average of 0.3 mg of iron was excreted in the urine and 1.75 mg in the feces, giving an iron retention of 1.19 mg. In the second series, in which the average iron intake was 6.5 mg in a diet furnishing 1.380 calories, the output averaged 0.49 mg in the urine and 2.8 mg in the feces, giving a retention of 3.21 mg.

On the basis of these findings, tentative allowances of iron for preschool children are recommended as follows: "For maintenance 0.12 mg per kilogram, for growth 0.20 mg per kilogram, or a total of 0.32 mg per kilogram. Since the results of the food analyses in this experiment indicate that the amount of iron in different foods may be considerably less than the most commonly used figures, and also since there are pronounced individual differences in the iron requirement of children, it would seem that a margin of safety of at least 50 per cent above this calculated requirement of 0.32 mg per kilogram should be allowed in planning the dietaries of preschool children. This would make a standard allowance of 0.48 mg per kilogram. On this basis the total daily iron requirement of the children in this study would be 8.23 mg or 0.62 mg per 100 calories. These figures are in close agreement with the allowance of 8.5 mg or 0.76 mg per 100 calories suggested by Rose, Vahlteich, Robb, and Bloomfield [E. S. R., 65, p. 290] and also with the iron intake of children in private homes observed by McKay [E. S. R., 56, p. 493]."

Phosphorus metabolism in infants: A comparative study of the phosphorus metabolism of healthy infants fed breast milk and cow's milk, D. B. Witt (*Amer. Jour. Diseases Children, 43 (1932), No. 2, pp. 306–316*).—This paper reports the data for phosphorus metabolism obtained in an investigation of the mineral metabolism of infants alternately fed cow's milk and breast milk. The methods followed and the data for calcium were given in an earlier paper (E. S. R., 51, p. 664).

The average intake of phosphorus was 0.654 g per 24 hours in the period in which cow's milk was fed and 0.258 g in the breast milk period. Corresponding outputs per 24 hours in the urine were 0.275 and 0.064 g and in the feces 0.119 and 0.044 g. The actual quantities of phosphorus absorbed were thus considerably larger during the cow's milk than the breast milk periods, 0.535 and 0.214 g, respectively. The average percentage absorption was higher on the breast milk, 83.1 per cent, than on the cow's milk, 81.1 per cent. The retention values were also higher for the breast milk, ranging from 51 to 63.8 per cent, than for cow's milk, from 29.2 to 44.2 per cent.

Basal metabolism of normal children: The puberty reaction, A. Topper and H. Mulier (*Amer. Jour. Diseases Children, 43 (1932), No. 2, pp. 327–336, figs. 2*).—Data are reported on the basal metabolism of 28 girls and 10 boys from 10 to 16 years of age at intervals of from 6 months to a year over a period of from 1 to 4 years. A definite increase in metabolism occurred before and during early puberty, followed by a decrease after puberty was established. There was no uniformity in the height or duration of the increased metabolism. Some of the children had no other symptoms of an overactive thyroid, and others showed symptoms which disappeared with the fall of the basal metabolic rate to the previous normal level.

The authors are of the opinion that this increased basal metabolism is physiologic during pubescence, and that the individual variations in the height

and extent of the increased metabolism make the adoption of normal standards difficult for this age period.

[Supplementary feeding in elementary schools] (*Massachusetts Sta. Bul. 280 (1932), p. 225*).—This is a progress report on results of studies of the comparative value of milk and tomato juice (E. Davies, B. Wait, and M. V. E. Voorneveld), and of the value of evaporated milk, for school food service (Davies, Wait, and O. A. Merriam).

Soft curd milk, S. M. WEISBERG (*West. Hosp. Rev., 18 (1932), No. 6, pp. 28, 29*).—The author reviews previous studies on soft-curd milk, especially those by Hill (E. S. R., 65, p. 689), and reports briefly without analytical data the results of a chemical study of soft-curd as compared with hard-curd milk. "From physicochemical measurements he has concluded that the concentration and distribution of the casein, calcium phosphates, and fat appear to differentiate a soft-curd cow's milk from hard-curd milk. On the other hand, the salt balance as a whole seems to be essentially the same for soft-curd and hard-curd milks, and the whey proteins and lactose seem to exercise no important part in determining the curd character of the milk."

No sharp distinction was found between the physicochemical properties of pure casein preparations from hard- and soft-curd milks. The percentage of tryptophane was quite constant in the two types of milk. Variations in the tyrosine content showed no correlation with curd character. In explanation of the value of soft-curd milk in the treatment of infantile eczema, the possibility is suggested of a different arrangement of the amino acids in soft-curd milk proteins resulting in harmless split products on partial digestion.

The importance is urged of further clinical work with soft-curd milk.

Effect of curd tension on the digestibility of milk, D. L. ESPE and J. A. DYE (*Amer. Jour. Diseases Children, 43 (1932), No. 1, pp. 62–69, fig. 1*).—Milk of varying curd tensions, as determined by the Hill method (E. S. R., 65, p. 689) with slight modification, was fed to dogs with Pavlov stomach pouches and the length of the digestive period determined by the secretion period and the analysis of the gastric juices which came from these pouches.

From 1.7 to 1.8 hours was required for an adult dog to digest milk of low curd tension, 98 g. and from 2.3 to 2.8 hours for milk of nearly double this curd tension, 190 g. Diluting the milk to secure lower curd tension without *decreasing the amount fed did not shorten the length of the digestive period. The percentage of casein in the milk appeared to be the greatest factor in*fluencing curd tension, although this accounted for only about 81 per cent of the change. Boiling the milk lowered, and acidifying it before coagulation with rennin raised, the curd tension. The addition of calcium chloride raised, and sodium citrate lowered, the curd tension.

The body temperature in rats on normal and deficient diets, S. V. GUDJONSSON (*Jour. Physiol., 74 (1932), No. 1, pp. 73–80, figs. 8*).—Measurements of the body temperature, as determined by a thermoelectrical probe checked against a standardized mercury thermometer, of rats on a normal and vitamin A-free diet are reported. In normal animals the rectal temperature was rather unstable, varying between 37 and 38° C. In vitamin A-deficient animals the temperature began to fall shortly before the appearance of clinical symptoms and reached an average level of about 1.5° below normal. Following the addition of vitamin A to the diet the temperature rose slightly, but did not reach the normal level during the length of the experimental period (from 8 to 10 weeks).

***Changes in the weights of various organs and systems of young rats* maintained on a low-protein diet,** M. LIMSON and C. M. JACKSON (*Jour. Nutrition, 5 (1932), No. 2, pp. 163–174, fig. 1*).—Data are presented and discussed on the weekly changes in weight and food consumption of 28 rats fed

from weaning on a diet consisting of sucrose 75, McCollum salt mixture (185) 4.5, and lard 20 parts, supplemented with from 0.3 to 0.5 g daily of a mixture of equal parts of dried brewery yeast and dried wheat germ, and cod-liver oil, 2 drops daily except during the fifth and sixth weeks, when 4 drops were given. For a period of 8 days, beginning in the eleventh week, the protein was supplemented by 0.3 g of purified casein daily. Some of the animals were killed during the sixteenth week and the others during the seventeenth week, at which time the average weight of all was almost the same as of 20 control rats from the same litter killed at the time the others were started on the experiment. Various organs of the controls and of the test rats at the time of death were weighed and compared statistically. The data are grouped as organs showing significant increases, significant decreases, and insignificant changes. The findings are compared with those reported in the literature for various types of dietary deficiency, with the following general conclusions:

"The dystrophic changes in organ weights in many respects show a remarkable degree of correspondence in various types of nutritional deficiency. This may be due to the common underlying factor of interference with the general process of nutrition, usually associated with a deficient intake of food. On the other hand, differences in the changes among the various organs (comparing different organs during the same nutritional deficiency, or the same organ during different deficiencies) may be due to specific differences in their nutritional requirements."

Clinical calorimetry.—XLVIII, Nitrogen equilibrium with a low protein diet, W. S. McClellan and R. R. Hannon (*Jour. Biol Chem., 95 (1932), No. 1, pp. 327–333*).—In this continuation of the series of papers, some of which have been noted previously (E. S. R., 64, p. 289), data are given on the nitrogen balance for a period of 106 days of a patient with diabetes mellitus on a diet containing 20 g of protein daily. On this exceedingly low intake nitrogen equilibrium was established during the last month of the period, with a level of nitrogen excretion of 1.78 g per day. This is said to be one of the lowest levels of urinary nitrogen excretion on record.

During the period of gradual reduction of carbohydrate in the diet to 30 g per day there was a gradual increase in acetone bodies in the urine but no perceptible increase in the urinary nitrogen excretion. Weight equilibrium was maintained throughout the entire period on a diet furnishing during the greater part of the time 2,000 calories per day. With a 10 per cent deduction for loss of energy in foodstuffs not absorbed from the intestinal tract the available energy was about 50 per cent above the average basal metabolism (1,800 calories) of the subject, who was in bed during the entire period of observation but was quite active at times.

The neutral diet, G. Enke (*Jour. Amer. Dietet. Assoc., 7 (1931), No. 3, pp. 228–234*).—This paper gives directions for constructing neutral diets, together with sample menus and tables giving the basic content of 100-g portions of common fruits and vegetables, with the approximate measure of each.

The effect of grapes and grape products on urinary acidity, L. G. Saywell (*Jour. Nutrition, 5 (1932), No. 2, pp. 103–120*).—This contribution from the fruit products laboratory of the University of California reports an investigation of the effect of fresh grapes and several grape products on the reaction and composition of the urine when ingested in considerable amounts. The ingestion of the grapes and grape products was followed by an increase in pH of the urine, until the final value was from 0.8 to 1 pH unit above that of the last day on the basal ration in all cases except the detartrated juice with an average increase of 0.5 to 0.6 pH unit. The increase in pH was accompanied by a decrease in the ammonia excreted and in the total acidity of the urine and

an increase in the alkaline reserve of the blood above normal. A positive correlation was noted between the alkalinity of the ash and the physiological reaction of the product.

The findings are thought to indicate that grapes and grape products are of value in maintaining the alkaline reserve of the body. In discussing the contrary conclusion of Pickens and Hetler (E. S. R., 63, p. 491), attention is called to the marked difference in the alkalinity of the ash of Concord grapes such as used by Pickens and Hetler and the grapes of the present study (Malaga, muscat, and Petit Sirah), as reported by Hartman and Tolman (E. S. R., 39, p. 208). The alkalinity of Concord grape juice is much lower than that of the grapes used in the present study and decreases to a marked extent on storage.

The relative value of inorganic and organic iron in hemoglobin formation, C. A. Elvehjem (*Jour. Amer. Med. Assoc., 98 (1932), No. 13, pp. 1047–1050, figs. 2*).—Following a concise review of the literature dealing with the relative value of organic and inorganic iron in the treatment of various anemias, experimental and human, a report is given, with experimental data, of a comparison of hematin as a source of organic iron and purified ferric chloride of inorganic iron in the treatment of rats rendered anemic by the method of Elvehjem and Kemmerer (E. S. R., 67, p. 90).

In the absence of copper neither source of iron was in the slightest degree effective. The regeneration of hemoglobin on hematin plus copper was less marked than on ferric chloride plus copper. In no case did the hemoglobin reach values above 9 g per 100 cc on the former, while with ferric chloride supplemented by copper values of 13 to 14 g per 100 cc were reached in 2 weeks and maintained indefinitely. When ferric chloride was administered in addition to the hematin and copper the values rose from 6 or 7 g to 17 g per 100 cc in 3 weeks' time. The livers of rats receiving the hematin were much lower in iron content than those of rats receiving the iron at the same level in the form of ferric chloride.

These results are thought to indicate that all iron compounds must be broken down into inorganic salts before the iron can be assimilated. In this connection attention is called to the erroneous use of the terms food iron and organic iron interchangeably. References to the literature are cited, showing that the entire iron content of egg yolk consists of inorganic iron and that at least one-half of the total iron in yeast is present in the inorganic form.

The content of plants, notably food plants, in aluminum [trans. title], G. Bertrand and G. Lévy (*Bul. Soc. Sci. Hyg. Aliment., 19 (1931), No. 8–9, pp. 359–368*).—Essentially noted from another source (E. S. R., 66, p. 193).

Nutrition of the dental tissues, C. F. Bödecker (*Amer. Jour. Diseases Children, 43 (1932), No. 2, pp. 416–425, figs. 4*).—This is a discussion of the author's theory that the exciting cause of dental decay is external, "probably an acid generated by the bacterial fermentation of particles of carbohydrate food," but that in addition a predisposing cause or causes exist. "One of these will be found in the abnormal constitution of the dental lymph developed by the malfunctioning of the pulp and by deficiencies of the blood. A normal dental lymph protects the teeth of the young healthy person against decay. It is, therefore, believed that the teeth possess a protective mechanism against this disease, the activity of which is in all likelihood dependent on the health of the body. In this relation the diet of a person is doubtless an all important factor."

A diagram is given of the nutritional channels of the dental tissues, together with photomicrographs of ground sections of teeth showing the manner in which the so-called dental lymph is distributed to the enamel.

Present-day theories of the cause of dental caries, M. Koehne (*Jour. Amer. Dietet. Assoc., 7 (1932), No. 4, pp. 335–352, figs. 2*).—This critical discussion emphasizes some of the weak points in present-day theories concerning the cause of dental caries and the facts that must be explained before its etiology is satisfactorily solved. A list of 33 references to the literature is appended.

Failures to produce experimental dental caries in the white rat with high carbohydrate diet and Bacillus acidophilus or with vitamin D deficiency, C. A. Lilly (*Jour. Nutrition, 5 (1932), No. 2, pp. 175–181, figs. 2*).—Various theories concerning the cause of dental caries were tested on white rats from stock on a satisfactory diet with negative results. The dietary measures which were tested for a year on rats 30 days old at the beginning of the experiment included Mendel's normal diet, a diet containing 53 per cent sugar but otherwise normal, a 53 per cent sugar diet with triweekly oral inoculations of a pure culture of *B. acidophilus*, and the Steenbock rachitogenic diet 2965, with and without viosterol. All the teeth were scrutinized under illumination and magnification for defects, and those showing the slightest suggestion of carious lesions were ground down to a thin section, bisecting the center of what appeared to be the lesion. Microscopic studies of these sections showed that what had appeared to be carious lesions consisted of "an amorphous debris in the occlusal pits."

These results are thought to answer in the negative two of the many theories suggested to explain dental caries and noted in a brief review of the literature, namely, a high carbohydrate diet with *B. acidophilus* and vitamin D deficiency.

Vitamin standards (*Analyst, 57 (1932), No. 672, pp. 173–177*).—This is a complete report of the recommendations of the international conference on vitamin standards (E. S. R., 66, p. 690).

[Vitamin studies at the Missouri Station] (*Missouri Sta. Bul. 310 (1932), pp. 4, 5, 6, 40*).—Brief progress reports are given on miscellaneous vitamin studies, including a comparison of various sources of vitamin B, by A. G. Hogan and L. R. Richardson; a continuation of the investigation of radioactive substances on vitamins (E. S. R., 66, p. 390) and a study of the nutritional requirements of rabbits, by Hogan and W. S. Ritchie; a preliminary report on the vitamin A content of Nancy Hall sweetpotatoes, by M. C. Hessler and B. Cole; and a study of the vitamin A and D content of January and June White Leghorn and White Rock eggs (E. S. R., 66, p. 390), by Hessler and S. Cover.

Vitamins in canned foods.—XI, A canned food diet, E. F. Kohman, W. H. Eddy, and C. Z. Gurin (*Indus. and Engin. Chem., 23 (1931), No. 9, pp. 1064–1066, figs. 7*).—This continuation of the series of papers noted previously (E. S. R., 67, p. 88) is a progress report of a demonstration which has been planned to determine the nutritional adequacy of a sole diet of canned foods through several generations of experimental animals—rats and guinea pigs. "The plan of experimentation is to feed a variety of four or five canned foods, chosen with a view to securing a balanced diet, for a period of 5 days. These foods are not mixed, and the animals are allowed to eat according to their own choice. The animals receive no irradiation treatment, nor are they exposed to the direct rays of the sun. At the end of each 5 days, a change is made to form a new combination of canned foods. Thus far 49 canned foods have been fed in 74 combinations, the plan being to repeat the combinations after all of the common canned foods have been utilized."

At the time of writing the experiment had been in progress 15 months, and the fifth generation of rats and the third of guinea pigs had been reached. According to the authors, reproduction was as prolific as could be expected, the

size of the litters was normal, and no difficulty was encountered in lactation. The rate of growth and weight at maturity were much higher than reported as normal. "The evidence indicates that canned foods may supply every dietary requirement."

A comparison of the dietary properties of "soybean milk" and cow's milk, S. WAN (*Chinese Jour. Physiol., 5 (1931), No. 4, pp. 353–362, figs. 4*).—In rat feeding experiments similar to those reported by Tso (E. S. R., 63, p. 193), fresh soybean milk and soybean milk powder were compared with whole milk powder (Klim), with the conclusion that the soybean milk is poorer in vitamin A but richer in vitamin B than cow's milk. The soybean milk was also deficient in vitamin D. When the soybean milk-wheat diet was supplemented with substances rich in vitamins A, B, and D and a complete salt mixture, the growth of the rats was better but still inferior to that on the diet containing cow's milk. This is attributed to inferiority in the soybean protein, an observation also noted by Tso and Chu on the basis of infant feeding experiments (E. S. R., 66, p. 791).

Salmon oil and canned salmon as sources of vitamins A and D, C. D. TOLLE and E. M. NELSON (*Indus. and Engin. Chem., 23 (1931), No. 9, pp. 1066–1069, figs. 7*).—In this extension of previous studies on the vitamin content of commercial fish oils (E. S. R., 65, p. 397), several samples of commercial salmon oil and oils prepared from canned salmon and salmon offal were tested for vitamins A and D by the same methods as in the previous study.

The oils from the offal of different species showed wide variations in vitamin A potency, with a striking correlation between depth of color and potency. The oils with a distinct reddish color, such as Chinook and sockeye, contained much more vitamin A than chum oil, which was practically colorless. The most potent and the least potent oils produced about the same rate of gain at 10-mg and 5-mg levels, respectively. The commercial samples of salmon oil showed about the same range of potency as the oils prepared from the offal. The oils from commercially canned salmon were not particularly potent in vitamin A. No response was secured at a 10-mg level and only a slight response at 50 mg.

Two of the three commercial salmon oils tested for vitamin D had about the same potency as the medicinal cod-liver oil used for comparison, and the third was about one-half as potent. Three of the five offal oils were twice as potent as the cod-liver oil, one about 50 per cent more potent, and one approximately equal to the cod-liver oil. Two of the five oils prepared from canned salmon were approximately twice as potent in vitamin D as the cod-liver oil and the other three about equal to the cod-liver oil.

Vitamin A content of body oils of Pacific coast salmon, R. W. TRUESDAIL and L. C. BOYNTON (*Indus. and Engin. Chem., 23 (1931), No. 10, pp. 1136, 1137, fig. 1*).—Data are reported on the vitamin A content of the body oils of five common species of Pacific coast salmon widely used as food. The technic of Sherman and Munsell was followed, but no attempt was made to evaluate the results in terms of Sherman units. All of the oils tested were found to be decidedly inferior to high grade medicinal cod-liver oil as a source of vitamin A. Of the different species, Chinook and sockeye oils contained more vitamin A than silver, humpback, or chum oils.

A new plant source of vitamin A activity, D. H. COOK and J. AXTMAYER (*Science, 75 (1932), No. 1932, pp. 85, 86*).—It is reported briefly that if crude annatto obtained from the fresh seeds of the plant *Bixa orellana* is extracted with cold 80 to 90 per cent alcohol a deep reddish brown solution is obtained which, on evaporation, leaves a dark colored sticky resinous material. This fraction is particularly free from bixin, the better known pigment of the seed,

but contains another pigment orellin. When an alcoholic solution of the resin was fed to rats on a vitamin A-free diet, growth at the Sherman unit rate resulted on a dosage of 3 mg daily. Since the seeds are estimated to yield 2 per cent of this active material, it is concluded that annatto is among the richest vegetable sources of vitamin A thus far reported. Preliminary tests with bixin confirmed the conclusion of Euler, Euler, and Karrer (E. S. R., 62, p. 112) that this pigment does not contain vitamin A.

The oxidation capacity of vitamin A containing substances [trans. title], H. von Euler and L. Ahlström (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, *204* (*1932*), *No. 3–4*, *pp. 168–180*).—Liver extracts have been shown to possess a high oxidation capacity (calculated as oxygen absorption per milligram substance per hour), especially those oils in which the antimony trichloride reaction of Carr and Price and the growth-promoting action were especially high. Concentrated vitamin A preparations from liver oils have also been shown to have extraordinarily high oxidation capacity values. These findings are thought to be consistent with the hypothesis that vitamin A is essential for the oxidation processes in the animal body.

On the dose of vitamin A in the form of carotene, A. Polak and J. A. Stokvis (*Arch. Néerland. Physiol. Homme et Anim.*, *16* (*1931*), *No. 4*, *pp. 542–551*).—The authors report success in curative and prophylactic vitamin A tests with a dosage of from 0.5 to 1 γ of carotene per rat per day, a dosage considerably lower than hitherto reported in the literature. Various suggestions to account for the difference have been ruled out, such as the possibility that the food contained traces of A, that the carotene might have been purer than the samples used by other investigators, that the rats may have differed from others in sensitiveness to xerophthalmia, and that the peanut oil used as the solvent may have contained traces of vitamin A.

Cutaneous lesions associated with a deficiency in vitamin A in man, C. N. Frazier and C.-K. Hu (*Arch. Int. Med.*, *48* (*1931*), *No. 3*, *pp. 507–514*, *figs. 2*).—This contribution from the Peiping Union Medical College describes cutaneous lesions of uniform character occurring along with the classic signs of keratomalacia in a group of Chinese soldiers who had subsisted for various periods of time on diets consisting chiefly of rice, maize, millet, occasionally a poor grade of wheat flour, white cabbage, and salted vegetables. As a rule the skin lesions preceded the appearance of the keratomalacia and responded rather more slowly to dietary treatment, which consisted of a well-balanced Chinese diet, chiefly vegetarian, to which were added liver, butter, and eggs. Cod-liver oil was also administered daily. The skin condition is described as "an excessive epithelial keratinization, resulting in the mechanical occlusion of hair follicles and sweat ducts, and in secondary degeneration of the sebaceous and sweat glands. Necrosis was a terminal event presumably dependent on the decreased resistance of the tissues to infection."

Relationship of vitamin A to respiratory infections in infants, L. H. Barenberg and J. M. Lewis (*Jour. Amer. Med. Assoc.*, *98* (*1932*), *No. 3*, *pp. 199–202*).—Attempts at lowering the incidence of respiratory disease in a child-caring institution in New York City (E. S. R., 61, p. 392) were extended in the autumn of 1930 to a comparison of the incidence and severity of respiratory infections in four groups of infants as follows: Nineteen receiving partly skimmed milk, 94 pasteurized milk with 20 drops of viosterol daily, 85 pasteurized milk and 3 teaspoonfuls of standardized cod-liver oil daily, and 6 pasteurized milk with 6 teaspoonfuls of cod-liver oil daily. All were given orange juice at 6 weeks, butter at 6 months, and vegetables at 8 months. The vitamin A content of the diets varied from 750 to 16,500 Sherman units a day for those under 6 months and from 2,130 to 18,000 for those over 6 months of age. In

spite of these wide differences there was no significant difference in the incidence or severity of respiratory infections in the four groups. The authors emphasize, however, that their results "are not applicable to infants receiving inadequate amounts of vitamin A in their dietary, for under such conditions fortifying the vitamin intake and thus rendering the dietary adequate may well have a beneficent and protective influence in regard to infection."

Influence of vitamin A deficiency upon intestinal permeability for bacteria, E. SEIDMON and L. ARNOLD (*Soc. Expt. Biol. and Med. Proc., 29 (1932), No. 4, pp. 393, 394, fig. 1*).—In this preliminary report data are presented showing an increased permeability of the intestinal tract in vitamin A-deficient as compared with normal rats. This was indicated by a higher concentration of test bacteria (*Bacillus typhi murii*) in the kidney, spleen, liver, and lungs of the vitamin A-deficient than of normal rats three and nine hours after the administration of the organism in large numbers by stomach tube.

Influence of vitamin A and B deficiency upon intestinal acid-base equilibrium and bacterial flora, E. E. SEIDMON and L. ARNOLD (*Soc. Expt. Biol. and Med. Proc., 29 (1932), No. 4, pp. 488–490, figs. 2*).—In the study of which this is the preliminary report, 65 rats weighing about 50 g each were placed upon each of three diets—a control consisting of casein, starch, Osborne and Mendel salt mixture, butterfat, and dried yeast, and the same diet with the butterfat and dried yeast, respectively, omitted. The animals in the vitamin A-deficient group were killed in a gas chamber after from 7 to 8 weeks, the B-deficient after 3 to 4 weeks, and the controls after 8 weeks, in all cases after a fasting period of 24 hours. The intestines were divided into segments and the contents used for prompt pH determinations and bacterial counts. The results in the former were expressed in graphs, with the pH concentrations as ordinates and the segments of the gastrointestinal tract as abscissas. In the bacterial count series the ordinates represented the percentage of bacterial flora on the basis of cecal flora as 100 and the abscissas the segments of the gastrointestinal tract.

The pH values were slightly higher in both of the vitamin-deficient groups than in the normal. Higher values for bacterial count were shown in both of the vitamin-deficient groups. The slope of the curve in the B-deficient series resembled more closely that of the normal controls than did that of the vitamin A-deficient group, which showed a much more marked rise in the first section of the duodenum.

Vitamin B in nutrition, J. R. ROSS (*Canad. Chem. and Metall., 16 (1932), No. 3, pp. 55–57*).—This is a general discussion of present knowledge concerning the various constituents of the original vitamin B complex. Several references to the literature are appended.

Wheat bran as a source of vitamin B, M. S. ROSE, E. MCC. VAHLTEICH, E. H. FUNNELL, and G. MACLEOD (*Jour. Amer. Dietet. Assoc., 7 (1932), No. 4, pp. 369–374, fig. 1*).—In quantitative determinations by the Chase and Sherman method (E. S. R., 66, p. 410) of the vitamin B (B_1) content of a commercial preparation of bran, 0.6 g fed seven times a week gave nearly unit growth. Attention is called to the lowered energy requirement "in this age of automobiles and other machines which relieve mankind of much physical labor," and the need of giving increased attention to food supplying liberal amounts of ash and vitamins without contributing greatly to total calories. In comparison with whole-wheat bread furnishing 62 vitamin B units and 100 calories per ounce, the commercial bran tested furnished at least 45 vitamin B units, with not more than about 30 calories per ounce.

On the vitamin B content of bread, Y. HASHITANI and T. SAKO (*Cereal Chem., 9 (1932), No. 2, pp. 107–117, figs. 8*).—In feeding experiments conducted

on pigeons with bread baked from doughs in which various quantities of dried brewers' yeast had been incorporated, it was found that from 0.3 to 0.4 per cent sufficed to satisfy the vitamin B requirement. Inasmuch as the same quantity was needed when fed separately as a supplement to ordinary white bread, it was thought that no appreciable destruction of vitamin B occurred during the baking of the bread.

The value of an increased supply of vitamin B_1 and iron in the diet of children, P. SUMMERFELDT (*Amer. Jour. Diseases Children, 43 (1932), No. 2, pp. 284–290, fig. 1*).—The cereal mixture developed by Tisdall et al. (E. S. R., 64, p. 391) was given in 4-oz. daily allowance in the diet of 11 children of approximately normal weight over a period of 10 weeks, while a control group of 10 children on the same diet received 4 oz. of ordinary cereals. For a second 10-week period the groups were reversed. The majority of the children had been in the preventorium where the observations were carried on for more than a month, and during the preliminary time had been on the regular diet which included milk, meat, eggs, vegetables, and fruits. During the experimental period care was taken that the children consumed the day's allowance of the cereals, but no observations were made of the quantity of the regular diet consumed.

In both series the children receiving the special cereal showed much greater gains in weight than the control group. In view of similar results reported by Morgan and Barry on the supplemental feeding of wheat germ (E. S. R., 63, p. 894), the author attributes the striking gains in weight to the extra vitamin B furnished by the wheat germ and yeast in the cereal mixture.

Inasmuch as the cereal contained at least 6.8 mg of iron per ounce as compared with 0.3 mg in ordinary cereals, a comparison was made of the hemoglobin values of the blood at the beginning and end of each period. Although the results were not as striking as in the case of the weight gains, the somewhat higher values in each case at the end of the period in which the special cereal had been fed were thought to demonstrate the value of this cereal in increasing hemoglobin content.

Dietary requirements for fertility and lactation.—XXIV, Further studies on the specific effect of vitamin B on lactation, B. SURE and M. E. SMITH (*Jour. Nutrition, 5 (1932), No. 2, pp. 147–153, figs. 4*).—Additional experimental evidence with a slightly modified technic is reported, corroborating the findings in the previous study of the series (E. S. R., 66, p. 94) that vitamin B exerts a specific beneficial influence on lactation unrelated to food intake.

The specific effect of vitamin B on growth, B. SURE, M. C. KIK, and M. E. SMITH (*Jour. Nutrition, 5 (1932), No. 2, pp. 155–162, figs. 5*).—Similar methods to those of the study noted above were followed with nonlactating rats. From records obtained on about 200 rats, representative cases have been chosen for illustration. In the earlier work dealing with the vitamin B complex, pairs of rats were used and in the later work on vitamin B (B_1) groups of three as in the previous study.

The growth curves showed (1) increased growth on the same food intake of rats receiving vitamin B complex as compared with those deprived of it, and (2) increased growth as the result of unlimited food consumption of rats receiving vitamin B as compared with those with food intake limited to that of the animals receiving no vitamin B. The authors conclude that "vitamin B exercises two physiological functions: (1) It plays a rôle in metabolism to the extent that, just as some of the essential amino acids, it is indispensable for growth without any reference to the food intake, and (2) it stimulates the appetite so as to allow a sufficient intake of all the dietary factors essential for optimum function of all physiological processes in the body."

Potato starch and refection, S. K. Kon (*Jour. Hyg.* [*London*], *31* (*1931*), *No. 4, pp. 543–549, figs. 2*).—This repetition of the earlier experiments of Kon and Watchorn (E. S. R., 59, p. 686), in which the phenomenon of refection was observed in rats on a vitamin B-free diet containing potato starch, was occasioned by the criticism of Mendel and Vickery (E. S. R., 61, p. 594), who suggested the possibility that potato starch contains vitamin B.

The data reported confirm the previous findings of Kon and Watchorn. Refection was almost the rule when raw potato starch was used, but did not appear in rats receiving steamed potato starch or rice starch. Since steaming did not alter the vitamin B content of other diets, it is concluded that the phenomenon can not be attributed to vitamin B in the potato starch.

The intra-uterine changes in the pregnant albino rat (Mus norvegicus) deprived of vitamin E, J. A. Urner (*Anat. Rec., 50* (*1931*), *No. 2, pp. 175–187, figs. 2*).—This paper describes the progressive changes observed in the uteri of vitamin E-deficient rats at daily intervals during pregnancy from the seventh to the twenty-first day, by which time the resorptions were complete with the exception of decidual bodies at the site of recent implantations.

Influence of deprivation of vitamin E in the rat on the course of lactation [trans. title], J. Morelle (*Compt. Rend. Soc. Biol.* [*Paris*], *108* (*1931*), *No. 34, pp. 804, 805*).—Attention is called to a form of paralysis, similar to that described by Evans and Burr (E. S. R., 58, p. 791), appearing in young rats just weaned from stock on a diet consisting chiefly of flour and bran and placed on the Pappenheimer rickets-producing diet. The symptoms appeared in about 20 per cent of the animals, with a mortality of 33 per cent. An extract of yeast was without effect, showing that the condition could not be due to lack of vitamin B. Cereal germ administered to pregnant rats at varying intervals before and after the birth of the young prevented the appearance of paralysis in the young, even when given 5 days after birth, and modified the severity when given 14 days after birth.

Vitamin B in anaemia, S. Davidson (*Lancet* [*London*], *1931, II, No. 26, pp. 1395–1398, figs. 3*).—The possible identity of vitamin B (B_1) with the antianemic factor in liver is discussed, and several case reports are given of vitamin B therapy in pernicious anemia and simple achlorhydric anemia. Of the four cases of pernicious anemia, only one showed any benefit following the administration of vitamin B in the form of marmite. In the one case of simple anemia neither vitamin B nor liver extract was of any value, but treatment with iron and ammonium citrate was followed by immediate improvement. Although these results are thought to indicate that the antianemic factor in liver is not vitamin B, it is suggested that vitamin B may be of value as a supplement in the treatment of pernicious anemia with liver extract in that by increasing the efficiency of the gastrointestinal tract it may exert a sparing action on the liver, thus making possible a decrease in the maintenance dose of the liver or liver extract. It is suggested that the apparent beneficial effect of the vitamin B extract in the one case noted may possibly be explained on this ground.

Treatment of anaemia of infancy with iron and copper, H. Josephs (*Bul. Johns Hopkins Hosp., 49* (*1931*), *No. 4, pp. 246–258, figs. 4*).—A statistical examination of the results obtained in treating a series of anemic infants with iron and iron and copper is reported, with the conclusion that copper accelerated the increase in hemoglobin when given in addition to iron, particularly after the hemoglobin had reached a value of about 50 per cent. Above this point the hemoglobin curves from cases on iron alone tended to flatten out, while those on iron and copper continued to increase up to about 70 per cent. The iron was given in the form of a 10 per cent solution of ferric ammonium citrate in doses of 2 cc per kilogram per day and the copper as a 0.5 per cent solution of copper sulfate in doses of 1 cc per kilogram per day. There appeared to be no differ-

ence in the speed of recovery whether the diet consisted of milk alone or supplemented by vegetables or eggs. Medicinal iron appeared to be far superior to food iron in causing a rapid recovery. It is suggested that the effect of the iron is first on the reticulocytes and then on the hemoglobin, and that copper appears to accelerate hemoglobin formation but has no effect on the reticulocytes.

The treatment of anaemias, J. M. VAUGHAN (*Lancet [London], 1932, I, No. 3, pp. 122–124, 125*).—In this concise summary of present knowledge concerning the etiology and treatment of anemias, the author states that "normal hematopoiesis is dependent upon adequate supplies of (1) iron, (2) copper, (3) at least two substances present in whole liver, (4) vitamin C, (5) some complex of vitamin B, and (6) secretion of the thyroid gland. A lack relative or absolute of one or more of these factors will produce anemia. The deficiency, whether single or multiple, may be caused by faulty intake due to unbalanced diet, faulty digestion in the gastrointestinal tract, faulty absorption from the intestines, faulty distribution through pathological blood vessels, or excessive strain placed on the normal storage depots by (a) sudden or chronic loss, such as hemorrhage, or (b) increased demand, as in pregnancy."

The part played by each of these factors is discussed, with references to the literature.

The treatment for secondary anemia: A study of the results in one hundred and twenty-six cases, C. S. KEEFER and C. S. YANG (*Arch. Int. Med., 48 (1931), No. 4, pp. 537–568, figs. 7*).—This paper discusses, on the basis of the study of the treatment of 126 cases of anemia in the general medical wards of the Peiping Union Medical College, the special clinical features and response to various treatments of anemias associated with hemorrhage, undernutrition, chronic dysentery, kala azar, pregnancy, hookworm, and other miscellaneous conditions.

Avitaminosis.—VI, Vitamin B lipemia versus inanition lipemia in the lactating rat and its nursing young, M. E. SMITH and B. SURE (*Soc. Expt. Biol. and Med. Proc., 29 (1931), No. 2, pp. 158–160*).—The lipemia noted in an earlier paper of the series (E. S. R., 66, p. 492) as occurring in lactating rats and their nursing young in vitamin B deficiency has been found to be much greater than that produced by inanition alone and not to be due to greater concentration of the blood or katabolism of the body tissues. As suggested in the earlier paper, the finding of marked lipemia in vitamin B deficiency may prove of aid to the diagnostician in vitamin therapy.

Avitaminosis and blood clotting function, I. N. KUGELMASS and E. L. SAMUEL (*Amer. Jour. Diseases Children, 43 (1932), No. 1, pp. 52–57*).—From determinations of the clotting components of the blood of rats during a preliminary period on stock diet and after definite signs of deficiency on diets free from vitamins A, B complex, D, and E, respectively, and of guinea pigs on a normal and vitamin C-deficient ration, the authors conclude in general that "deficiency in vitamins in the daily dietary produces in the clotting mechanism a tendency toward potential bleeding without actually inducing bleeding. This alteration in the clotting mechanism is generally the result of nutritional dystrophy rather than of specific vitamin deficiency." Deprivation of vitamin A was considered to produce a gradual diminution in the fibrinogen content of the blood but no change in the platelet level, of vitamin B a slight diminution in the fibrinogen content, of vitamin C no change in the clotting components of the blood, and of vitamin D a diminution in the prothrombin and fibrinogen content of the blood without appreciable change in the platelet concentration.

The protective measures of the State of California against botulism, K. F. MEYER (*Jour. Prev. Med., 5 (1931), No. 4, pp. 261–293, fig. 1*).—This paper gives a history of botulism in the United States leading up to the organization

of the California Inspection Service, and describes the principles and procedures which are now used in order to make this service effective. In closing, attention is called to the definite increase during 1929–1930 in outbreaks of botulism caused by home-canned foods. "Irrespective of the fact that botulism is one of the few diseases which can be readily avoided, groups of people continue to ignore the two following simple rules:

"(1) All home-canned vegetables and other nonacid foods should be thoroughly boiled before use. (2) The person who opens the container and prepares the contents for the table should be familiar with the standards of quality and should ruthlessly discard any product which has leaky lids, an 'off odor,' or other signs of spoilage."

Commenting upon the customary advice always to use a pressure cooker for the canning of nonacid foods, the statement is made that few, if any, of the people who have been the victims of botulism in recent years had either the money or the intelligence to use a pressure cooker. The author is of the opinion that "only the education of the masses as to the necessity for boiling all home-canned vegetables before use will in time prevent the frequent and needless deaths from these products."

Further observations on the occurrence of iodine in relation to endemic goitre in New Zealand and on iodine metabolism, C. E. Hercus, H. A. A. Aitken, H. M. S. Thomson, and G. H. Cox (*Jour. Hyg. [London], 31 (1931), No. 4, pp. 493–522, fig. 1*).—Included among the extensive findings reported in this continuation of studies noted previously (E. S. R., 55, p. 389) are data on the iodine content of soils from districts in Australia and the Pacific islands adjacent to New Zealand, the iodine content of soils and grass as affected by manures containing iodine, the iodine content of various edible products from districts in New Zealand and the Pacific islands, a comparison of the iodine content of soils, grass, eggs, and milk from Samoa where there is no goiter and from goitrous and nongoitrous districts in New Zealand, calculations of the iodine content of the dietaries in 15 institutions in New Zealand, and miscellaneous iodine determinations.

Basal metabolism in diabetic children, A. Topper (*Amer. Jour. Diseases Children, 42 (1931), No. 4, I, pp. 760–766, figs. 2*).—Studies are reported on the basal metabolism of 27 insulin-treated diabetic children at six-months intervals over a period of from 1 to 4 (in 1 case 6) years, amounting to a total of 100 determinations.

In 28 tests conducted on subjects between the ages of 5 and 10 years, the average basal metabolic rate was +3 per cent, in 21 tests on subjects between the ages of 10 and 12 years +4, in 31 between the ages of 12 and 15 +5, in 18 between the ages 15 and 17 +21, and in 2 tests on subjects over 17 years old +7 per cent. These results agree quite closely with those reported by Joslin and White (E. S. R., 61, p. 796). The marked increase in the basal metabolic rate of the 15- to 17-year-old group is considered to be a manifestation of puberty, as noted by various investigators for normal children between the ages of 11 and 14 years. In this connection the author notes that observations in the diabetic clinic with which she is connected show a definite delay in sexual maturity of diabetic children as compared with other children of the same race.

The source of excess calcium in hypercalcemia induced by irradiated ergosterol, A. F. Hess, H. R. Benjamin, and J. Gross (*Jour. Biol. Chem., 94 (1931), No. 1, pp. 1–8*).—The authors have repeated the experiments of Jones et al. (E. S. R., 65, p. 194), from which the conclusion was drawn that the source of the excess calcium in irradiated ergosterol hypercalcemia is the food and not the body tissue, and have demonstrated that the failure of Jones and

his coworkers to obtain hypercalcemia in dogs on a calcium-free diet was due to the use of insufficient amounts of irradiated ergosterol. When only 10 mg of the material was given daily for a short period, there was no appreciable rise in the calcium concentration of the serum, but with 50 mg there was a marked increase. It was found possible to reduce the hypercalcemia to a marked extent by intravenous injections of sodium bicarbonate. These were followed by a decrease in the calcium excreted in both urine and feces. On autopsy a marked excess of calcium and phosphorus was found in the lungs and kidneys.

On the chemical nature of pellagra toxin and the thiosulphate treatment of pellagra, I. SABRY (*Lancet [London], 1931, II, No. 19, pp. 1020–1022*).—The author believes that human pellagra is not a vitamin deficiency disease, but is caused by a toxin introduced into the body in foods or produced within the body by the action of an organism. The toxin, which is considered to be a dioxyphenylalanine, is thought to react with certain oxidases in the skin to bring about the pigmentation which is characteristic of pellagra and to be counteracted by sodium thiosulfate administered intravenously in daily doses of 10 cc of a 10 per cent solution. The number of injections required for complete cure is said to vary according to the case from 20 to 60.

The pellagra-preventive value of canned spinach, canned turnip greens, mature onions, and canned green beans, G. A. WHEELER (*Pub. Health Rpts. [U. S.], 46 (1931), No. 45, pp. 2663–2668*).—Following the methods used in previous studies by Goldberger and associates in determining the pellagra-preventive action in human subjects of various foods (E. S. R., 62, p. 595), the author has found that onions are a very poor source, canned green beans a relatively poor source, canned spinach an important contributory source, and canned turnip greens an especially good source of the pellagra-preventive factor. The value of turnip greens is emphasized particularly.

The influence of solar rays on metabolism with special reference to sulphur and to pellagra in southern United States, J. H. SMITH (*Arch. Int. Med., 48 (1931), No. 5, II, pp. 907–1063, figs. 135*).—In this extensive monograph various theories concerning the etiology of pellagra are reviewed, and its geographic distribution and seasonal incidence are discussed with particular reference to solar radiation, with the following general conclusions:

"That there are biologic effects due to radiant energy is not open to question, and that some of these are related to pellagra seems probable. An adequate supply and a normal metabolism of sulfur appear to exert a protective influence against the pathologic effects of solar irradiation. The evidence suggests that an inadequate supply of sulfur as cystine is an important cause of pellagra, and that the abnormal metabolism of sulfur is an important feature of pellagra.

"The distribution of pellagra and the variations in its prevalence and incidence suggest that solar irradiation, under certain abnormal conditions of nutrition, is an important factor in the etiology of pellagra, and that the reaction to solar rays not only is conditioned by the nutritive state but depends on a state of the tissues determined by contrasts in degree and intensity of exposure during the annual cycle."

A bibliography of 122 titles is appended.

Production of experimental polycythemia with cobalt, J. M. ORTEN, F. A. UNDERHILL, E. R. MUGRAGE, and R. C. LEWIS (*Soc. Expt. Biol. and Med. Proc., 29 (1931), No. 2, pp. 174–176*).—In the course of nutritional anemia studies noted previously (E. S. R., 65, p. 894), a polycythemia was observed in rats receiving certain mixtures of metals with copper as supplements to the milk-iron diet. Preliminary observations are reported indicating that cobalt is the element responsible for this condition.

The effect of a diet of polished rice on the mineral content of the carcasses of pigeons, J. S. McHargue and W. R. Roy (*Amer. Jour. Physiol., 99 (1931), No. 1, pp. 221–226, fig. 1*).—In this contribution from the Kentucky Experiment Station analyses are reported of polished and unpolished rice and of the ash of normal pigeons, polyneuritic pigeons, and polyneuritic pigeons cured with unpolished rice. Unpolished rice contained more than four times as much ash as polished rice. The percentages of copper, zinc, sodium, nitrogen, sulfur, and fat did not differ greatly in the polished and unpolished rice, but the percentages of manganese, iron, and phosphorus in the polished rice were a little less than half and those of calcium, magnesium, and potassium about a third of the corresponding percentages in the unpolished rice.

Polyneuritic pigeons were found to have a higher percentage of ash and lower percentages of phosphorus and potassium than normal pigeons. In pigeons which had regained their normal weight on unpolished rice, the potassium was restored to normal levels but not the phosphorus. The ash of polyneuritic pigeons had a slightly higher percentage of calcium than normal, while in cured pigeons the percentage was slightly lower than normal. Phosphorus was slightly lower than normal in the polyneuritic and cured pigeons

As noted previously (E. S. R., 66, p. 197), pigeons were cured of polyneuritis by wheat, barley, rye, white corn, and yellow corn as well as by unpolished rice, but weight was restored only on the unpolished rice, wheat, and yellow corn. Analyses of the ash of these cereals showed that those which produced normal gains in weight contained slightly larger quantities of copper, manganese, and iron. From these results the inference is drawn that "the minor mineral constituents, as well as the major constituents calcium, magnesium, phosphorus, and potassium, are factors in protecting pigeons from polyneuritis."

Some considerations of the nutrition problem in pulmonary disease, B. Gordon and E. S. Tai (*Amer. Rev. Tuberc., 24 (1931), No. 6, pp. 673–677*).—Further observations are reported on the effect of various dietary measures on the treatment of pulmonary tuberculosis and other respiratory diseases (E. S. R., 66, p. 393), with the conclusion that overnutrition is helpful in enabling patients to withstand intercurrent respiratory infections and that cod-liver oil concentrates furnishing vitamins A and D are of value in acute upper respiratory infections. A brewery yeast compound containing vitamin B and manganese also proved helpful in the treatment of a few patients with asthma. No specific influence of the diets on the healing of tuberculous lesions was noted.

Rickets, J. M. Smellie (*Jour. State Med., 39 (1931), No. 12, pp. 718–727, fig. 1*).—The author discusses, with references to the literature, the essential differences in the etiology and treatment of simple rickets and renal rickets. Both disorders are considered to represent a condition of defective calcification. In simple rickets defective absorption of phosphorus is considered to be the primary etiological factor, and in renal defective excretion of phosphorus. For this reason vitamin D, so essential in the cure of simple rickets, is considered to aggravate renal rickets by increasing the phosphorus absorption.

Irradiated milk: The energy requirements for antirachitic activation, G. C. Supplee, M. J. Dorcas and A. F. Hess (*Jour. Biol. Chem., 94 (1932), No. 3, pp. 749–763, figs. 4*).—With the use of standardized sources of radiation, including various types of carbon arcs and mercury arcs in quartz, milk in 1,000-lb. lots was irradiated under controlled conditions in a commercial plant and then dried by the Just process. The freshly dried milk was tested for antirachitic and calcifying potency by the curative method. Some of the milk was also used in preventive tests on a series of negro infants.

It was shown that with suitable quality and quantity of radiant energy applied under uniform conditions the antirachitic and calcifying properties of milk could be increased with regularity within a few seconds without the development of objectionable flavor and odor frequently reported as developing in milk after exposure to ultra-violet light. The milk that was used in clinical tests was activated with a carbon flaming arc under conditions of a total of 3,654,000 ergs between 2,000 and 3,400 a. u. per cubic centimeter for a period of 16 seconds, the milk being exposed to the radiation in the form of a moving film 0.4 mm thick which received the rays at constantly changing angles of incidence varying from 0° to 90°. Immediately after irradiation the milk was dried by the Just process and the desiccated product hermetically sealed in inert gas. Several negro infants were fully protected from rickets during the height of winter and showed marked calcification of the epiphyses on this milk as the sole source of vitamin D. It is also noted that in a number of cases the milk proved of definite curative value when fed during February and March to negro children with definite rickets.

Irradiated milk: The amount of vitamin D and its rate of formation, G. C. Supplee, Z. M. Hanford, M. J. Dorcas, and H. H. Beck (*Jour. Biol. Chem., 95 (1932), No. 2, pp. 687–697, figs. 2*).—Data obtained in the study noted above have been used to calculate the efficiency of the reaction of imparting antirachitic potency to milk by irradiation and the vitamin D content of the milk produced under varying conditions.

It was found that up to certain limits the degree of antirachitic potency bears a direct relationship to the amount of energy applied, but that beyond these limits there is no direct relationship between the two.

"The rate of vitamin D formation in milk and the quantum efficiency of the reaction are greatest during the very early stages of the process, which, under the conditions of these experiments, occurred during the first few seconds of exposure. The maximum concentration of vitamin D in the milk irradiated according to these methods was found after approximately 2,500,000 e per cubic centimeter had been applied. Calculations indicate that this concentration is equivalent to about 0.0025 mg per liter, or practically 12 times that of the nonirridiated milk."

The antirachitic factor in preserved eggs [trans. title], E. Lesné and R. Clément (*Compt. Rend. Soc. Biol. [Paris], 107 (1931), No. 26, pp. 1533, 1534*).—The yolks of eggs preserved in limewater or water glass for eight months have been shown to possess appreciable antirachitic properties. Commercial egg powder made by drying whole eggs protected rats against rickets in quantities amounting to 2 per cent of the diet. It is thought, however, that eggs are not rich enough in vitamin D to have any therapeutic value.

Antirachitic efficiency of winter sunlight in Chicago as transmitted through certain samples of commercial ultra-violet glass, J. T. Hauch and M. E. Hanke (*Indus. and Engin. Chem., 23 (1931), No. 12, pp. 1398–1402, figs. 8*).—Rats on the McCollum rachitic diet 3143 were exposed to sunlight behind ultra-violet glass and ordinary glass at street level in Chicago from February 4 to March 1 and from March 16 to April 7, respectively. The animals behind ordinary glass in both periods and behind ultra-violet glass in February were not protected against rickets, while those exposed to sunlight through ultra-violet glass in the March-April period were fully protected. "These results indicate that there is a critical difference between the rickets-preventing efficiency of February sunshine and March-April sunshine behind commercial ultra-violet glass in Chicago at street level."

Seasonal variation in the antirachitic effect of sunshine, F. F. Tisdall and A. Brown (*Amer. Jour. Diseases Children, 42 (1931), No. 5, pp. 1144–

1147.)—Records for a third year have been added to previous records of the antirachitic effect of sunshine in the latitude of Toronto at different seasons of the year (E. S. R., 60, p. 694). The accumulated data show that the increase in antirachitic effect of the sunshine in Toronto occurs about February 15, at which date the maximum altitude of the sun above the horizon is 35°. The constant results obtained during the three years are thought to lend added weight to the conclusions (E. S. R., 59, p. 896) that the antirachitic effect of sunshine is dependent to a large degree upon the altitude of the sun above the horizon, and that with this information the period of the year during which rickets will develop in any part of the world can be calculated.

This theory has been applied to the observations reported by Lewis, Frumess, and Stein (E. S. R., 65, p. 96) concerning the antirachitic effect of winter sunshine in Colorado. It is pointed out that in Denver the sun reaches an altitude of 35° above the horizon by February 8. However, at Toronto, which is only 350 ft. above sea level, the air mass through which the sun's rays pass when the sun is 35° above the horizon is 1.71 units, while in Denver, on account of its altitude of 5,300 ft., the sun's rays pass through 1.71 units of air mass when the sun is only 29° above the horizon, an altitude reached in Denver as early as January 15. This and the lessened degree of moisture in the winter atmosphere in Denver are thought to explain the conclusions reached by Lewis et al. that there is no marked difference in the antirachitic effect of winter and summer sunshine in Colorado.

A review of patents and the application thereof involving irradiated cereal products, E. S. STATELER (*Cereal Chem., 8 (1931), No. 5, pp. 433–437*).—This review is limited to patent grants dealing with the process of irradiation of foods by ultra-violet light.

Infection of the accessory sinuses and upper respiratory tract in avitaminosis of rats, R. G. TURNER and E. R. LOEW (*Jour. Infect. Diseases, 49 (1931), No. 3 pp. 244–263, fig. 1*).—In continuation of previous studies on the bacteria of the upper respiratory tract and middle ear of rats deprived of vitamin A (E. S. R., 63, p. 493), the authors have compared the bacteria found in the nasal cavities and middle ears of a large number of rats when suppurative lesions were present with the flora when suppuration was absent.

The outstanding pyogenic organism in the suppurative lesions were *Staphylococcus aureus*, chromogen 6, and the colon bacillus. Environmental conditions were considered to play a part in the incidence of colon bacilli and staphylococci but not of chromogen 6. This organism increased in percentage with increasing severity of the symptoms produced by absence of vitamin A.

"Chromogen 6 apparently has an elective affinity for the mucous membrane of the upper respiratory tract and nasal cavities. It fails to thrive when injected intraperitoneally or intramuscularly into common laboratory animals. The pathogenicity of chromogen 6 is attributed largely to the lowered resistance of the mucous lining of the nasal cavities brought about primarily through withdrawals of vitamin A from the diet."

Recent advances in knowledge of scurvy and the antiscorbutic vitamin, A. F. HESS (*Jour. Amer. Med. Assoc., 98 (1932), No. 17, pp. 1429–1433*).—This review and discussion of the literature of the past decade is presented under the headings pathology of scurvy, symptomatology, association of scurvy with infections, the capillary resistance test, involvement of the nervous system, foods, the antiscorbutic vitamin, pathogenesis, and incidence of scurvy.

Concerning the incidence of scurvy, the author states "in New York City cases are exceptional, for it has become almost routine to include orange juice or tomato juice in the dietary of the infant, and adults partake of potatoes, fruit, or vegetables throughout the year. Economic conditions have, however,

always had an effect on the incidence of scurvy, and it is quite possible, if not probable, that the economic depression in this country and abroad may entail an increase in latent and manifest scurvy in adults as well as in infants."

The treatment of peptic ulcer with gastric mucin, S. J. Fogelson (*Jour. Amer. Dietet. Assoc., 7 (1932), No. 4, pp. 359–368, figs. 6*).—In this discussion of the experimental and clinical results in the use of hog gastric mucin in the treatment of peptic ulcer, the author emphasizes the important part which must be played by the dietitian in making this treatment a practical success, in that the treatment consists in the administration of large amounts of the mucin at frequent intervals during the day for a period of at least six months.

The present status of light therapy: Scientific and practical aspects, E. Mayer (*Jour. Amer. Med. Assoc., 98 (1932), No. 3, pp. 221–230, figs. 4*).—This extensive and critical discussion of the literature is presented under the following headings: Some physical properties of light, some biologic effects of light, further physiologic effects of light, light and moving air from outdoors, sunlight v. carbon arc and quartz mercury vapor arc lamp, pigment, dosage, technic of exposures, and clinical results.

TEXTILES AND CLOTHING

[Textile research in Iowa] (*Iowa Sta. Rpt. 1931, p. 93*).—Textile investigations, reported on briefly, included data on the determination of regenerated cellulose in the presence of cellulose acetate, cotton, silk, or wool, by R. Edgar and R. M. Hixon; and the development of quantitative chemical methods for the determination of cellulose acetate in the presence of other common textile fibers, by F. Sims and Edgar.

A study of the effects of light and air on the physical properties of weighted and unweighted silks, N. M. Roberts and P. B. Mack (*Jour. Home Econ., 24 (1932), No. 2, pp. 151–165, figs. 5*).—This paper reports an extensive investigation of the effects of two different weighting processes and subsequent treatment of various kinds on the physical properties of silk from the same original bolt.

During the weighting process there were considerable losses of strength regardless of the processing. Omission of the usual commercial dressing process did not affect the strength tests in new fabrics, but the dressed samples did not lose so greatly in breaking strength on aging as did the undressed samples, particularly upon exposure to indoor daylight. The saving in durability brought about by applying dressing did not compensate for the loss in breaking strength brought about by the weighting process itself. The figures for resistance to tear of the dressed pieces immediately after weighting were considerably higher than those of the new, undressed pieces except in the case of the most heavily weighted piece. Two samples which had amounts of weighting and dressing closely comparable to those of a large number of silks on the market retained 4.4 and 4.7 per cent of their original tear resistance after 4 months' exposure to indoor light. The tear resistances were only 4.56 and 1.56 per cent, respectively, of the resistance of degummed, dressed, but unweighted pieces of the same series after the same period of exposure to indoor light.

Aging for 6 months in the dark or for 4 months in indoor light produced slightly greater losses in breaking strength in unweighted and only slightly weighted samples than was produced in 100 hours with a General Electric S-1 lamp. With the two most heavily weighted pieces the relation was reversed.

Effect of storage in the dark on the breaking strength of weighted and unweighted silks, A. A. D'Olier and P. B. Mack (*Jour. Home Econ., 24 (1932), No. 2, pp. 165–170, figs. 3*).—This paper supplements the one noted above. Data are given on the breaking strength of the unweighted and weighted silks

during storage in a dark room for various periods of time. The losses were found to be small as compared with the losses suffered by the same series upon exposure to indoor daylight for much shorter times.

The effect of laundering upon the durability of white and colored cotton fabrics, A. E. GINTER, K. M. ADKINS, and M. SHADDUCK (*Missouri Sta. Bul. 310 (1932), p. 40*).—Data as to shrinkage are briefly noted.

HOME MANAGEMENT AND EQUIPMENT

Making homes, H. SHULTZ (*New York: D. Appleton & Co., 1931, pp. XX+519, figs. [192]*).—This text for a secondary school course in housing and home making has been developed on the unit plan under nine divisions, dealing essentially with home life and shelter, relation of housing to health, the location of the house as it affects home life, floor plans in relation to individual needs, architecture, household furnishings, the care of furnishings, the work of the home, and domestic service as a problem of home making.

Tests of gas home-heating equipment, R. B. LECKIE and C. H. B. HOTCHKISS (*Purdue Univ., Engin. Expt. Sta. Research Ser. 36 (1931), pp. 166, pls. 9, figs. 8*).—The purpose of the investigations reported in this bulletin was to secure data indicating the heat absorption efficiencies which can be obtained from some of the leading types of gas conversion units when tested under laboratory conditions. A gas-designed boiler was included in the tests to provide a standard for the evaluation of the tests on conversion burners. Tests also were made on one solid fuel boiler using five different conversion burners. Two power-driven gas conversion units were tested, one of which made use of refractory material and of the principle of surface combustion, while the other had no refractory but allowed the gas-air mixture to burn close to the wall of the furnace. Two units of the Bunsen type were also selected. A fifth unit tested was of the jet type. The test work involved both constant and intermittent operation. The conversion burners were tested under both methods, and similar tests were conducted on gas-designed boilers.

Apparently an increase in thermal efficiency may be expected when proper baffling is inserted in a boiler. However, the need for baffling is dependent on the design of the boiler, and no improvement can be expected in the design of conversion burners that will take care of this feature. It also was found that efficiency was raised approximately 2 per cent by insulating the boilers. Increasing the stack draft increased the percentage of oxygen in the flue gases and reduced the efficiency of the plant. It appears that an approximate reduction of 1 per cent in thermal efficiency of the boiler may be expected for each per cent increase of oxygen in the stack gas.

Boilers designed for solid fuel gave about as good results with reference to efficiency as gas-designed boilers. The use of an oversize boiler was not found necessary to secure high efficiency with a conversion burner. The conclusion is drawn that a conversion burner if properly installed in an efficient dometic steam boiler will operate with good absorption efficiency. Under constant operation high thermal efficiencies were obtained with the conversion burners operating in boilers of different sizes and dissimilar in construction.

Equipment for cooking foods with heat generated by the resistance of the food to an alternating current, L. J. PEET and L. SATER (*Iowa Sta. Rpt. 1931, p. 92, fig. 1*).—A brief summary is given of the results obtained in the use of the apparatus described previously (E. S. R., 65, p. 196) for cooking meat. A photograph is given of the entire apparatus.

The dirt-lifting efficiency and wear produced on carpets by different types of vacuum sweepers, C. J. LYNDE (*Jour. Home Econ., 24 (1932), No. 3,*

pp. 257–261).—The vacuum sweepers studied include three of the motor brush type and three of the straight air type with fixed brushes removed. Comparisons are reported of the dirt-lifting efficiencies of these machines as measured by the amounts of a standard dirt lifted by each machine from a definite space on a Wilton velvet rug by a standardized procedure. An arbitrary value of 100 per cent efficiency was set for the removal of 30 g of the dirt and the values calculated in terms of this. Wear on the carpets was tested on an Axminster rug in terms of the weight of nap removed in 1,000 strokes of the machine.

It was concluded that the motor brush vacuum sweepers have a somewhat higher dirt-lifting efficiency than the straight air sweepers with fixed brushes removed, but that the former wear the carpet more than the latter. In no case was the wear serious.

MISCELLANEOUS

Report of the Hawaii Agricultural Experiment Station, 1931, J. M. Westgate et al. (*Hawaii Sta. Rpt. 1931, pp. [2]+38, figs. 17*).—The experimental work not previously noted is for the most part abstracted elsewhere in this issue.

Report on agricultural research [of the Iowa Station] for the year ending June 30, 1931, C. F. Curtiss et al. (*Iowa Sta. Rpt. 1931, pp. 128, figs. 17*).—The experimental work not previously abstracted is for the most part noted elsewhere in this issue.

Annual Report of the Massachusetts Agricultural Experiment Station, 1931, F. J. Sievers et al. (*Massachusetts Sta. Bul. 280 (1932), pp. 187–250*).—The experimental work not previously referred to is for the most part abstracted elsewhere in this issue.

Experiment station research work of the Missouri Agricultural Experiment Station during the year ending June 30, 1931, F. B. Mumford, S. B. Shirky, et al. (*Missouri Sta. Bul. 310 (1932), pp. 67, fig. 1*).—The experimental work not previously abstracted is for the most part noted elsewhere in this issue.

Annual Report of [Nevada Station], 1931, [S. B. Doten] (*Nevada Sta. Rpt. 1931, pp. 29*).—The experimental work not previously abstracted is for the most part noted elsewhere in this issue.

Publications available for free distribution (*Idaho Sta. Circ. 67 (1931), pp. 4*).—The available station and extension publications are listed.

Fifty-year index to personnel and publications of the Ohio Agricultural Experiment Station, [1882–1931], C. E. Thorne (*Ohio Sta. Bul. 501 (1932), pp. 188, figs. 15*).—"This index includes a complete list of the members of the station's board of control, with their terms of service; members of the station staff; a list of the station's publications, except its press bulletins, with the title, number, and year of publication; and a subject index."

Michigan Agricultural Experiment Station Quarterly Bulletin, [May, 1932], edited by V. R. Gardner and A. J. Patch (*Michigan Sta. Quart. Bul., 14 (1932), No. 4, pp. 233–306, figs. 22*).—In addition to articles abstracted elsewhere in this issue or previously, this number contains an article entitled Washington, the Master Farmer, by C. P. Halligan (pp. 235–237), and abstracts of the following: Soil Maps as a Basis for Mapping Original Forest Cover, by J. O. Veatch[3] (p. 293), and An Attempt to Prevent the Formation of Mycoderma Scums on Pickle Brine by the Use of a Mercury Vapor Lamp, by F. W. Fabian and C. S. Bryan[4] (p. 294).

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[3] Mich. Acad. Sci., Arts, and Letters, Papers, 15 (1931), pp. 267–273, fig. 1.
[4] Fruit Prod. Jour. and Amer. Vinegar Indus., 11 (1932), No. 5, pp. 134–137.

NOTES

Nebraska Station.—A duplex cottage has been built at the North Platte Substation for housing two of the staff members. The approximate cost is $10,000.

Nevada Station.—The committee on hydrology of snow of the American Geophysical Union, whose chairman is the station meteorologist, has now accumulated over 300 answers to its questionnaire on the present status and proposed ideals of the pioneer science of snow surveying and stream flow forecasting. This questionnaire has revealed a strong demand for a standardization of efforts and a roster of the men interested.

New York State Station.—Mabel Ruttle-Nebel, assistant in research (botany), has resigned, effective July 1.

Pennsylvania College and Station.—A recent ruling by the State attorney general requiring, on account of reduced State income, a 24.16 per cent reduction in appropriations to what are termed "nonpreferred" institutions diminishes the available income of the institution for the present fiscal year by about $1,000,000. The State appropriations for the current biennium aggregated about $4,000,000, and $2,000,000 of this sum had been expended during the first year, prior to the ruling. A statement from President R. D. Hetzel states that "not only will both the resident and extension instructional programs be seriously affected by the operation of this ruling, but research work vital to the industries of the State including agriculture, the mineral industries, and many other important industrial interests which are looking to the research program at the college for assistance in these trying times will have to be *discontinued*."

Puerto Rico Station.—Henry C. Henricksen, agriculturist since 1916, has been retired under the provisions of recent Federal legislation.

Tennessee Station.—A sheep barn in the form of an open shed, 102 by 84 ft., is being built at the Middle Tennessee Station at Columbia. This structure will be used in experimental work as a breeding, lambing, and feeding shed, also for weighing, shearing, and dipping.

Washington College and Station.—G. B. Swier and Ralph McCall have been appointed instructors in animal husbandry in the College of Agriculture and assistants in animal husbandry in the station.

American Society of Agricultural Engineers.—This society held its twenty-sixth annual meeting at Columbus, Ohio, June 20–23, 1932. Its outstanding event was a general session symposium on An Engineer's Policy for Agriculture, the principal speakers being Arthur Huntington, public relations engineer of the Iowa Railway and Light Corporation; J. T. Jardine, chief of the U. S. D. A. Office of Experiment Stations; and Dr. C. F. Kettering, president of the General Motors Research Corporation, with several others prominent in research, teaching, extension, and commercial lines participating in the discussion. The remainder of the meeting was, as usual, divided into general sessions and special sessions relating to the work of the college division and the four technical divisions of power and machinery, structures, land reclamation, and rural electrification.

The president's annual address was presented at the general sessions by Dr. L. J. Fletcher, of the Caterpillar Tractor Company. Special papers also were given on Some Economic Aspects of an Engineered Agriculture, by M. L. Wilson, of the Montana Experiment Station; Artificial Drying of Agricultural Products, by R. B. Gray, of the U. S. D. A. Bureau of Agricultural Engineering; and Fertilizer Application for Corn Production, by C. O. Reed, of the Ohio Station; and Soil Erosion—A National Menace, by L. A. Jones, of the Bureau of Agricultural Engineering.

The principal speakers of the college division sessions were G. Amundson, of Michigan State College; B. D. Moses, of the California Station; R. W. Trullinger, of the Office of Experiment Stations; and R. J. Baldwin, director of extension of Michigan State College. They discussed, respectively, the relation of commercial and college extension work, the coordination of agricultural engineering research with the work of the commodity branches of agriculture, the logical future development of research in agricultural engineering, and the place of agricultural engineering in extension work.

The principal speakers of the power and machinery division session were L. A. Hawkins, of the Research Laboratories of the General Electric Company; E. A. Silver, of the Ohio Station; L. M. K. Boelter, of the University of California; F. P. Hanson, of the Caterpillar Tractor Company; Dr. L. D. Baver, of the Missouri Station; R. Bainer and J. P. Fairbank, of the California Station; T. Midgley, of the Ohio State University; and R. H. Wileman, of the Indiana Station. Special problems in the kinematics of grinding machinery, grain threshing, soil dynamics, tractor fuels and ignition, and corn production by mechanical methods under corn borer conditions were discussed.

The structures division session dealt with dairy barn and manger standards, barn paints, ventilation of animal shelters, and dairy refrigeration equipment. The principal speakers were J. L. Strahan, consulting agricultural engineer, M. A. R. Kelley and S. P. Lyle, of the Bureau of Agricultural Engineering, H. B. White, of the Minnesota Station, and F. L. Fairbanks and H. W. Riley, of the New York Cornell Station.

The land reclamation sessions featured several papers and addresses on land drainage and irrigation, the outstanding address being presented by Dr. Elwood Mead, U. S. Commissioner of Reclamation, who dealt with the Social and Economic Value of Electrical Development in Federal Reclamation. Other speakers of these sessions included H. H. Musselman of the Michigan Station and F. E. Staebner and G. R. Boyd of the Bureau of Agricultural Engineering.

The rural electrification sessions, in most instances, were held jointly with the sessions of the other technical divisions. The program included symposiums on electric hotbeds and soil heating, developments in farm-wiring practices, and the productive uses of light in agriculture, and a forum dealing with problems in the engineering development of farm electrification.

At the annual banquet E. J. Stirniman, recently agricultural engineer for the Grain Trust, U. S. S. R., gave an illustrated talk entitled An Agricultural Engineer's Observations in Russia. The first Cyrus Hall McCormick medal was awarded at this banquet to Major O. V. P. Stout, of the Bureau of Agricultural Engineering, for "outstanding and meritorious engineering achievement in agriculture."

Officers for the coming year were elected as follows: President, C. E. Seitz, of Virginia Polytechnic Institute; vice presidents, W. W. McLaughlin, of the Bureau of Agricultural Engineering, and R. W. Carpenter, of the Maryland Station; and secretary-treasurer, Raymond Olney, St. Joseph, Mich.

EXPERIMENT STATION RECORD

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EDITORIAL

THE SIXTH INTERNATIONAL CONGRESS OF GENETICS

rom the viewpoint of agricultural science, the outstanding gather- of the past summer was doubtless the Sixth International Con- of Genetics, held from August 24 to 30, 1932, at Cornell Uni- y, with a final day on August 31 at the New York State Ex- ent Station. In spite of many unpropitious conditions incident ie world-wide financial depression, the congress was well at- ed, financially self-sustaining, and remarkably successful in r ways.

he total registration approximated 550, besides many visitors. t of those present were naturally from the United States and ada, but practically all of the European countries were repre- d, and a number were accredited to South America, the Orient, other parts of the world.

ot only was the attendance gratifying in its quantitative aspects, it was also very satisfactory from the criterion of leadership. An sual proportion of the leading genetic workers of the day were wn together. This was in itself a notable achievement under the itions.

Arrangements for the congress were largely intrusted to the exec- e council, of which Dr. C. C. Little was chairman and Dr. C. B. venport representative of the permanent international committee, h the active assistance of the host institutions. In general the lities available were excellent and reflected much credit upon se in charge.

he accomplishment of the organizing committee which proved ecially convenient and was much appreciated was the distribu- on the opening day of volume 2 of the proceedings. This is tractive volume of over 400 pages containing English abstracts apers and descriptions of the exhibits. It is expected that me 1, containing the invitation papers in full and other data, l also be available very shortly.

The unique and outstanding feature of the congress was unques- ionably the exhibits. In the words of Dr. R. A. Emerson, chair-

man of the Cornell University committee of arrangements, "this was the first time that any genetics congress has attempted to exhibit the results of genetic research, and no science congress of any kind, so far as I am aware, ever before attempted an exhibit on anything like the same scale. Thirty-nine rooms in five university buildings were filled with indoor exhibits, and a garden of 3 acres was devoted to growing plants. Exhibits were sent by 350 persons." Dr. M. Demerec was in active charge.

The plant breeding garden at the university was set aside for living plant exhibits for practically all of the farm crops, including growing corn plants representing about 200 mutations and carefully labeled to show not only special characters but in many cases linkage relations. Numerous examples of other growing plants were selected for specific genetic and nongenetic characters or their inheritance in crosses. There were also other extensive exhibits, including many wild and ornamental plants and the lower forms of plant life.

The animal exhibits depicted the common practices of rearing various types of insects used in genetic studies, and the methods of conducting certain tests so that the findings might readily be interpreted. These were shown as both live and mounted specimens. The poultry exhibit included many live birds and mounted specimens to show specific mutations, the influence of inbreeding, etc. Striking exhibits of prepared specimens of pheasants and guinea fowl were brought from Italy, and turkey skins showed various types of feather patterns caused by the known genetic factors.

The program of the congress was so arranged as to devote the mornings to general sessions, while the afternoons were available for what were termed demonstration papers, sectional programs, tours of inspection, and a wide variety of recreational features. Ample provision was also made for a study of the exhibits, which so far as possible were made available at all times.

The total number of addresses and papers approximated 230. A large proportion of these were contributed on invitation by the foreign delegates, so that the international aspects of the congress were always in evidence. The contributions of the agricultural colleges and experiment stations of this country were appreciable, however, including over 50 papers, or about 25 per cent of the total number.

Following an address of welcome at the opening session by Professor A. R. Mann of Cornell University, the presidential address was given by Dr. T. H. Morgan of the California Institute of Technology. Dr. Morgan took for his subject The Rise of Genetics, speaking particularly of the advance made during the past 10 years in the mapping of the chromosomes, the study of linkage relations, and the correlation of the cytological study of the chromosomes with genetic

observations. He also emphasized the increasing attention being given to the influence of the gene complex as revealed by individual characteristics. As regards future study, he enumerated as the five most important subjects the physical and physiological development of the gene, the physical interpretation of changes taking place after conjugation of the chromosomes, the relation of genes to characters, the nature of mutation process, and the application of genetics to horticulture and animal husbandry.

Most of the general sessions were built around a central theme. The principal subjects at these sessions were mutations, the interrelation of cytology and genetics, the genetics of species hybrids, and the contributions of genetics to the theory of organic evolution. The interest shown in these general meetings was well sustained, the assembly hall, seating about 600 people, being crowded at practically all times.

The sectional programs, which ran for the most part concurrently, afforded opportunity for much intensive discussion. At Ithaca three sessions were devoted to cytology, two each to general genetics, animal genetics, and plant genetics, and a single session each to human genetics, methods and technic, genetics and phytopathology, chromosome structure and crossing over, genetics of species hybrids, Drosophila, problems relating to sex and fertility, and genetics and pathology.

The final day of the congress was held on the grounds of the New York State Station at Geneva. Here also there were extensive exhibits, and opportunity was provided to observe at first hand the work of the station. The formal program included an address of welcome by Director U. P. Hedrick and a series of 12 papers dealing with fruit and vegetable breeding.

At the final general session of the congress a decision was reached to hold the seventh congress in 1937. The place of meeting will be decided by the permanent committee, which includes Dr. O. L. Mohr of Oslo, Norway, as chairman and representatives from Austria, Belgium, Denmark, Finland, France, Germany, Great Britain, Italy, Japan, the Netherlands, Sweden, Switzerland, the Union of Socialistic Soviet Republics, and the United States. Dr. R. A. Emerson has been designated as the representative of this country on the committee.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical investigations of the California Station] (*California Sta. Rpt. 1931, pp. 83, 84*).—Data are reported as to the crystal structure of l-erythrose and on copper absorption by plants.

Report of the assistant chemist, J. O. CARRERO (*Porto Rico Sta. Rpt. 1931, pp. 9–13, fig. 1*).—The report summarizes results of analyses of several sugarcane varieties, and the development of a method for the preliminary precipitation as an aluminum salt of the phosphoric acid content of cane juices, the aluminum process making possible a more accurate and convenient determination of the phosphate.

Preparation and study of the cereal glutelins (*Nebraska Sta. Rpt. [1931], pp. 29, 30*).—Mesonin, a third protein in gluten, is described.

[Studies on the Van Slyke method for protein analysis] (*Indiana Sta. Rpt. 1931, p. 50*).—Work on this method (E. S. R., 26, p. 22) as affected by the presence of fats is briefly noted.

Photochemistry of vitamins A, B, C, D, F. P. BOWDEN and C. P. SNOW (*Nature [London], 129 (1932), No. 3263, pp. 720, 721, fig. 1*).—This is a preliminary report of a study of the photochemistry of the vitamins with the use of a large quartz monochromator. The procedure followed was to study the absorption spectrum of the substance and then irradiate the material with an intense beam of light of similar wave length to that of the absorption band selected as most characteristic. "This procedure usually destroyed the electronic system producing the band, and often led to the development of new bands. When applied to a suitable previtamin, monochromatic irradiation with light of the correct wave length produces maximum yields of the vitamin. On the other hand, when the destruction by irradiation of the biological activity of a vitamin is effected by the elimination of an absorption band, the activity can be linked up conclusively with the presence of the band."

The method as applied to vitamin A consisted first in observing the absorption spectrum of β-carotene. This was found to contain a weak band at 2,700 a. u., which was considered to be of importance. A solution of carotene in cyclohexane was accordingly irradiated in an atmosphere of nitrogen by the mercury line 2,650 a. u. After a few hours an absorption band developed corresponding closely to that at 3,280 a. u., considered characteristic of vitamin A. The transformation of the carotene into vitamin A was confirmed by the antimony trichloride test. The destruction of vitamin A has also been effected by irradiation with light of wave length 3,130 a. u.

A specimen of vitamin B_1 prepared by Jansen and Donath was found to show 3 absorption bands at 2,600, 2,400, and 2,100 a. u. Irradiation by the mercury line 2,537 a. u. reduced the intensity of the band at 2,600 and destroyed the vitamin B_1 action of the sample. In the study of vitamin C, both hexuronic acid and narcotine were used. The former showed a strong absorption band at

2,650 a. u. which was only slightly affected by irradiation. The latter showed bands at 3,000, 2,850, and 2,400 a. u. No change was produced by irradiation with light corresponding to the first two wave lengths, but with the third a complete change in the spectrum took place, resulting in a single band at 2,900 a. u.

Difficulty was experienced in applying the same principle to ergosterol and calciferol (vitamin D) on account of the fact that the five narrow bands of ergosterol are almost covered by a wide calciferol band of shorter wave length. The best results were secured in the transformation of ergosterol into calciferol with irradiation by the 2,967 a. u. line and in the destruction of calciferol by irradiation for one hour with the mercury lines at 2,650 or 2,537 a. u. A very slow destruction of calciferol took place on irradiation by the 3,130 line.

Photochemistry of vitamins A, B, C, D, I. M. Heilbron and R. A. Morton (*Nature* [*London*], *129* (*1932*), *No. 3267*, *pp. 866, 867*).—In this reply to the preliminary report of Bowden and Snow, noted above, their claim to have discovered a new and powerful technic for the study of the vitamins is criticized on the grounds (1) that the technic is familiar and has already been applied in vitamin studies, and (2) that the idea of applying one method to several vitamins underestimates their wide differences in chemical constitution. Statements made by Bowden and Snow for each of the vitamins are criticized, with frequent references to the literature.

Characterisation of vitamin-A.—Part 1, Spectroscopic evidence, I. M. Heilbron and R. A. Morton (*Jour. Soc. Chem. Indus., Trans.*, *50* (*1931*), *No. 22*, *pp. 183T, 184T*).—This is chiefly a condensed report of an investigation noted previously (E. S. R., 67, p. 341). It is also noted briefly that carotene reduced by aluminum amalgam approaches the criteria for vitamin A in that it shows an intense absorption band in the ultra-violet, with a maximum near 320 mμ, and gives an intense blue color with antimony trichloride with a sharp absorption band at 583 mμ. It reveals, however, an additional band in the color test near 650 mμ.

Vitamin A and the antimony chloride reaction, A. Emmerie, M. v. Eekelen, and L. K. Wolff (*Nature* [*London*], *128* (*1931*), *No. 3229*, *pp. 495, 496*).—The conclusion of Heilbron et al. (E. S. R., 67, p. 341) that the strength of different vitamin A preparations, as determined by spectroscopic examination of the blue antimony trichloride reaction mixture, corresponds better with the absorption in the 572 mμ region than in the 610 mμ region has been confirmed by the demonstration that when a vitamin A preparation from saponified cod-liver oil or a saponified extract of beef liver was treated with a few drops of furan, methylfuran, pyrrole, indole, or skatole and then tested with antimony trichloride, the 610 mμ band was no longer visible while the 572 mμ band remained unaltered. The physiological activity of the preparation was not impaired, and the preparation without antimony trichloride retained the 328 mμ band. Since liver may contain indole-like substances, the greater intensity of the 572 mμ than the 610 mμ of some liver preparations is explainable. The authors state that they have obtained saponified vitamin A preparations in which the two bands were of equal strength and others in which one or the other of the two bands was the more intense.

Vitamin A and carotene.—VIII, High potency vitamin A concentrates, T. Moore (*Biochem. Jour.*, *25* (*1931*), *No. 6*, *pp. 2131–2135*, *fig. 1*).—In this continuation of the series noted previously (E. S. R., 66, p. 592), vitamin A concentrates prepared by the same method from the liver oils of rats and pigs which had received large amounts of carotene as red palm oil and from turbot- and sole-liver oils were compared by the antimony trichloride test and found to

be of practically the same concentration, although initial values of the oils varied widely. In biological tests with the rat oils, growth was restored by doses of 0.001 mg of the concentrate. The results are considered to suggest "either that the concentrates must have consisted substantially of actual vitamin A, or alternatively that the vitamin must have been associated with other substances of similar solubility properties in remarkably constant proportion."

The method of concentrating the vitamin consisted in saponifying the oils by brief boiling with alcoholic potassium hydroxide, extracting the unsaponifiable matter with ether, separating the vitamin fractions from the bulk of crystalline material by extraction with cold methyl alcohol, and removing the last traces of sterols by digitonin.

Attention is called to the extreme change in solubility in methyl alcohol from the insoluble carotene to the almost miscible vitamin A, as previously noted (E. S. R., 64, p. 393), to the similar observations by Angus et al. (E. S. R., 66, p. 9) that vitamin D is much more soluble in methyl alcohol than is the provitamin ergosterol, and finally to the statement of Olcott and Mattill (E. S. R., 66, p. 608) that vitamin E is readily soluble in methyl alcohol. These observations are thought to indicate that the fat-soluble vitamins as a class are characterized by extreme solubility in methyl alcohol.

Properties and structures of crystalline vitamins, J. D. Bernal (*Nature [London], 129 (1932), No. 3263, p. 721*).—A brief note confirming and supplementing previous observations (E. S. R., 67, p. 201). It is stated that "the crystals of vitamin B_1 show a large, flat cell, and that and their strong negative birefringence point to ring molecules. The same is true of hexuronic acid. The crystals of β-carotene and the related α-crocetin do not show the long spacings expected from the constitution of these bodies, but further work is necessary to elucidate their structure."

The antineuritic vitamin.—I, The method of assay, concentration of the vitamin with silver under various conditions, and its solubility in certain organic solvents, R. J. Block, G. R. Cowgill, and B. H. Klotz (*Jour. Biol. Chem., 94 (1932), No. 3, pp. 765–782*).—This paper reports various observations which have been made during the course of an attempt to repeat the study of Jansen and Donath (E. S. R., 57, p. 489) on the isolation of vitamin B.

In determining the potency of the various fractions, a combination of weight-maintenance and curative technics on pigeons was followed which is described in detail. One of the essential features of the method consists in supplementing the customary basal diet of polished rice by capsules furnishing additional protein of good quality and vitamin G in the form of meat residue, fat-soluble vitamins in cod-liver oil, and salts in the Osborne and Mendel salt mixture. The potency of the preparations tested was expressed in pigeon units, the unit being defined as "the amount required to maintain the body weight constant over a period of from 10 to 14 days in the case of a 300-g pigeon fed according to the method described in this paper." When the weight of the pigeon differs markedly from 300 g, the measured dose is corrected by a calculation based upon the formula developed by Cowgill and Klotz (E. S. R., 57, p. 488).

A study of the concentration of the antineuritic vitamin by silver under various conditions was undertaken after attempts to repeat Jansen and Donath's work along this line had resulted in considerable loss in activity. Ten experiments were carried out, using various combinations of acids, silver salts, and bases. As sources of the silver ion nitrate and lactate salts were used, of the H-ion nitric, sulfuric, and lactic acids, and for alkalizing barium

or sodium hydroxide. The vitamin concentrate used in the tests was a Lloyd's reagent concentrate prepared from rice polishings. Treatment with silver nitrate, lactic acid, and barium hydroxide gave the most favorable purification with the least loss of activity and treatment with silver lactate and lactic acid and sodium hydroxide the greatest increase of potency, but at the expense of considerable loss of the vitamin.

In attempts to prepare a solution of the vitamin free from inorganic salts, dilutions of various concentrated preparations were heated on a steam bath with a 1 : 1 solution of 95 per cent ethyl alcohol and carbon tetrachloride, with gradual removal of the water by distillation. As the concentration of alcohol approached 100 per cent the inorganic salts were precipitated, but the vitamin remained in the liquid phase from which it could be recovered quantitatively. Six other alcohols were substituted for ethyl alcohol in this procedure, but only *n*-butyl and allyl alcohols proved as efficient as ethyl alcohol. The solubility of the vitamin in mixtures of methyl alcohol with acetone, allyl, or amyl alcohol was tested, but with unsatisfactory results.

The antineuritic vitamin.—II, Removal of impurities by oxidizing agents, R. J. BLOCK and G. R. COWGILL (*Jour. Biol. Chem., 96 (1932), No. 1, pp. 127–132*).—A modification in the carbon tetrachloride technic for concentrating vitamin B noted above, involving simultaneous oxidation of carbohydrate impurities, is described. After trial of a number of oxidizing agents 30 per cent hydrogen peroxide was selected as most satisfactory for the purpose. Several experiments were carried out to determine the most favorable proportions to use, and it was found that a ratio of total grams of organic solids to number of cubic centimeters of H_2O_2 above 0.5 gave the best results from the standpoint of clearness of solution and preservation of potency. The technic is outlined for the preparation of vitamin B_1 concentrates from rice polishings by the oxidation-carbon tetrachloride method. The solution as finally obtained "contained all of the original vitamin potency. It was free from inorganic salts, yielded no amino nitrogen in the Van Slyke apparatus, and was suitable for parenteral injection. There was no appreciable decrease in total nitrogen during this procedure. This concentrate can serve as a starting point for further work on the chemistry of the vitamin as well as a source of the 'pure' antineuritic vitamin."

The relation of deterioration of orange juice to its iodine reducing value, M. A. JOSLYN and G. L. MARSH (*Science, 76 (1932), No. 1960, pp. 82, 83*).—This preliminary note states that direct titration of orange juice with standard iodine solution has been found to give a good indication of the extent of the darkening of orange juice during storage and of general deterioration in quality. The greater the darkening the lower was the iodine titration. In view of recent evidence that the reducing substance in orange juice is hexuronic acid and that this appears to be vitamin C, it is suggested that the iodine titration may serve as an indication of the probable vitamin C potency of preserved orange juice.

Crystalline vitamin D, C. E. BILLS and F. G. MCDONALD (*Jour. Biol. Chem., 96 (1932), No. 1, pp. 189–194, figs. 2*).—Following the method described in a previous paper (E. S. R., 65, p. 595), the authors have translated the findings of leading investigators concerning the potency of their vitamin D concentrates into international units (E. S. R., 66, p. 690), with the following results:

The cod-liver oil coefficient formerly used by the authors as the standard of comparison was calculated to have a value of 160 international units per gram. Various concentrates prepared by the authors are estimated to have values in terms of the international standards of 98,000 (E. S. R., 61, p. 294),

71,000 (E. S. R., 66, p. 307), 100,000 (E. S. R., 64, p. 504), and 25,000 (E. S. R., 66, p. 608) international units per milligram. The last value given was that of the crude resin obtained on a large scale.

Among the crystalline preparations reported in the literature are those of A. Jendrassik and G. Keményffi, calculated to have a value of 70,000 international units, that of Reerink and van Wijk (E. S. R., 62, p. 804) 69,000, the supposedly pure vitamin D crystals of Askew et al. (E. S. R., 66, p. 709) 40,000, and the crystalline vitamin D_1 of Windaus et al. (E. S. R., 66, p. 709) 36,000 international units per milligram.

The realization that very active resins were of the same order of potency as several crystalline preparations led the authors to reexamine several resins which had been stored at 0° C. in an atmosphere of CO_2. It was found that slow crystallization had occurred, and that the older preparations were solid crystalline masses.

The wide variation in vitamin D potency of various crystalline preparations and the ease with which an impure resinous preparation can change into the crystalline state led the authors to conclude that "the crystalline state is *evidence of relative, not absolute, purity in vitamin D*. The best crystalline preparations as yet described are probably isomorphous mixtures containing a large percentage of inert material."

Chemical and physical properties of petroleum spray oils, J. R. GREEN (*Jour. Agr. Research* [*U. S.*], *44* (*1932*), *No. 10*, *pp. 773–787*, *figs. 8*).—In this study, made at the Moutuna Experiment Station, although no single analysis of spray oils was found to be directly correlated with injury to apple leaves and barley seedlings, the relation of certain properties of the oils to injury was shown. Sulfonatable portion, sulfur, bromine absorption, acidity, ability to emulsify, and color all increased with increasing injury.

Methods of determining bound water in plant tissue, J. D. SAYRE (*Jour. Agr. Research* [*U. S.*], *44* (*1932*), *No. 9*, *pp. 669–688*, *figs. 2*).—Since "no satisfactory definition of bound water can be made," all water that is not free water, that is, that does not show some of the common properties of liquid water, is here considered as bound water.

Comparison was made among three methods, namely, the cryoscopic method, founded on the theory that bound water can dissolve no sucrose; and the calorimetric and dilatometric methods, based upon the assumption that bound water does not freeze.

"The calorimeter method is recommended for the measurement of bound water in practically all materials, since it is easy, rapid, accurate, and reliable. Whenever possible, however, determinations should be made on the material by each of the several methods."

SOILS—FERTILIZERS

[Soil studies of the California Station] (*California Sta. Rpt. 1931*, *pp. 36, 37, 83, 84, 94–96*).—The report notes the progress of the alkali reclamation work, the determination of the essential nature of the base-exchange material of soils, phosphate fertilization, the forms of potassium in the soil and the absorption of this element by crops, soil analyses, studies of the relation of the moisture equivalent to the mechanical composition of the soil, studies of the effect of soil salinity upon the water vapor absorption of soils, measurements of subsidence of peat lands, and soil temperature studies, including work on paper mulches.

[Soil researches of the Connecticut State Station] (*Connecticut State Sta. Bul. 337* (*1932*), *pp. 477–481*, *fig. 1*).—Brief notes on findings are presented

under the following captions: Lysimeters show top-dressing necessary, enlarge scope of leaching studies, vegetable fertilization, and a study of New England forest soil.

[Soil and fertilizer work], R. W. RUPRECHT, R. M. BARNETTE, W. H. CONNER, and R. V. ALLISON (*Florida Sta. Rpt. 1931, pp. 61, 62–64, 65, 66, 152, 153, 159, 160*).—Data are reported as to the effect of varying amounts and carriers of potash on potatoes; the iodine content of Florida grown crops; the effect of green manures on the composition of soil; the decomposition of forest, range, and pasture growths to form soil organic matter; and soils investigations and other studies upon the rôle of special elements in plant development upon the peat and muck soils of the Everglades.

[Soil and fertilizer work of the Indiana Station] (*Indiana Sta. Rpt. 1931, pp. 13, 52*).—Notes on the relative efficiency of nitrogen fertilizers (E. S. R., 65, p. 112) and studies of laboratory methods of determining the fertilizer requirements of soils for crop plants, with special emphasis on the Neubauer method (E. S. R., 66, p. 407), are included.

[Soil investigations of the Nebraska Station] (*Nebraska Sta. Rpt. [1931], pp. 18–20*).—The results of studies of the response of winter wheat to top-dressing with nitrogen fertilizers, the decomposition of organic matter in soils under field conditions, and cooperative fertilizer experiments (E. S. R., 65, p. 809) are briefly noted.

[Studies on soil fertility and the formation of forest soils] (*New Hampshire Sta. Bul. 262 (1932), pp. 8–10, 23*).—Investigations under the supervision of F. S. Prince and P. T. Blood, with the chemical work done by T. G. Phillips and G. P. Percival, include further experiments (E. S. R., 66, p. 17) on the production of hay and the use of legumes on neglected hay lands, the growing of potatoes in a rotation, and legumes in the Connecticut River Valley.

Under the head of the formation of forest soils are presented summary reports on a study of the rates at which litter is deposited under different types of forest; and an investigation of the effects of autumn leaves from various species upon soil acidity.

[New Jersey soil investigations], J. G. LIPMAN and A. W. BLAIR (*New Jersey Stas. Rpt. 1931, pp. 43, 44, 58–61, 384–386*).—Under the head of nitrogen research are described experiments with tomato plants receiving ammonium salts, ammonium hydroxide, and nitrates at various pH values. Under the captions of soil chemistry and bacteriology and soil microbiology are briefly noted some phases of work on the rôle of microorganisms in the decomposition of organic matter, the chemical nature of soil humus, the nutrition of the mushroom, soil fertility, soil profile and base-exchange studies, and other topics. The report contains also a note by J. S. Joffe on iron and aluminum colloids in the soil.

[Soil Survey Reports, 1927 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1927, Nos. 30, pp. 32, fig. 1, map 1; 34, pp. 35, pls. 2, fig. 1, map 1; 35, pp. 50, fig. 1, map 1*).—The surveys recorded in these reports were made with the cooperation, respectively, of the Alabama Department of Agriculture and Industries, the California Experiment Station, and the Wisconsin Geological and Natural History Survey and the University of Wisconsin College of Agriculture.

No. 30. *Soil survey of Franklin County, Alabama*, J. F. Stroud et al.—Franklin County consists of 414,080 acres of northwestern Alabama, the surface being "mainly rough and broken," with a natural drainage ranging from adequate to excessive.

This report notes 20 types, assigning them to 13 series, of which soils Atwood loam and Atwood gravelly loam make up 12 and 13.2 per cent, respectively.

Undifferentiated (Guin), rough stony, and meadow lands constitute 45.6 per cent of the county.

No. 34. *Soil survey of the Placerville area, California*, R. E. Storie and D. F. Trussell.—The Placerville area comprises 371,200 acres, about one-third of Eldorado County. The surface features are those of foothill lands, and drainage is provided by a number of streams.

The report lists 8 series having 14 types. The more extensive agricultural soils mapped and described are Aiken clay loam, covering 17.1 per cent of the area, and Aiken stony clay loam 11.9 per cent. Of use mainly for forestry is 28.9 per cent of rough mountainous land which, with 9.3 per cent of rough stony land and 1.7 per cent of placer diggings and tailings, is listed unclassified.

No. 35. *Soil survey of Trempealeau County, Wisconsin*, M. J. Edwards et al.—Trempealeau County occupies 476,800 acres in west-central Wisconsin, its area being covered by a well developed drainage system, while the surface features of the county range from the hilly through the rolling and gently rolling to gently undulating plain.

The soils are classified as 11 series inclusive of 19 types. Boone silt loam amounting to 28.7 per cent of the total area, 16.2 per cent of rough broken land mainly useful as timber land, and Clinton silt loam amounting to 12.4 per cent are among the soil areas differentiated.

[Illinois soil reports] (*Illinois Sta. Soil Rpts. 52 (1932), pp. 44, pls. 3, figs. 9; 53, pp. 18, pls. 2, figs. 7*).—These reports continue the series previously noted (*E. S. R., 66, p. 811*).

No. 52. *Fayette County soils*, E. A. Norton, R. S. Smith, E. E. DeTurk, F. C. Bauer, and L. H. Smith.—Fayette County has a soil area "characterized by mature, light-colored soils," comprising 458,092 acres varying in topography from the nearly level to the knoll and ridge type of surface features. Drainage flows mainly to the Kaskaskia River.

Classified in the same system of color-texture types used in previous reports of this series, these soils consist of 21.66 per cent of a gray silt loam on tight clay, 12.45 per cent of yellow-gray silt loam on compact medium-plastic clay, 12.41 per cent of eroded gravelly loam, 12.02 per cent of gray silt loam on orange-mottled tight clay, and other types to a total of 23.

No. 53. *Calhoun County soils*, R. S. Smith, E. E. DeTurk, F. C. Bauer, and L. H. Smith.—Calhoun County occupies a long ridge between the Illinois and Mississippi Rivers, the upland having a well developed drainage system. The county covers an area of 180,204 acres.

The soils of Calhoun County are an eroded silt loam amounting to 39.22 per cent of the total area, a brownish yellow-gray silt loam of which the extent was found to be 21.28 per cent, and other color-texture types making a total of 14. An aggregate area of 2.21 per cent of swamp was found, and 8.19 per cent was shown to consist of rivers and lakes.

[Notes on the State soil survey] (*Maryland Sta. Rpt. 1931, pp. XXI, XXII*).—The report contains a summary briefly indicating the predominating soil series in various counties.

The influence of lime, fertilizer, and manure on the buffer action of a soil, H. C. Harris (*Delaware Sta. Bul. 177 (1932), pp. 20, figs. 6*).—Composite samples, each made up from 10 borings with a soil auger, were taken from the 16 $\frac{1}{10}$-acre plats of an area of Sassafras silt loam soil. Titration curves of these soils in the field-moist condition and after air drying were determined with the aid of a hydrogen electrode used in conjunction with a saturated calomel electrode.

Preliminary experiments showed that the air-dry soil was slightly more buffered than the field-moist soil. Buffer action determinations on the field-

moist soil from 10 of the plats were then made, the buffer index values of this soil increasing with the addition of increasing amounts of H_2SO_4 or NaOH, "suggesting that the hydrogen-ion concentration of the soil may influence its buffer action.

"Farm manure and the fertilizers applied to these plats appear to have had no appreciable influence on the buffer action of this soil. Lime increased the buffer action of this soil toward H_2SO_4 and decreased it toward NaOH."

Availability of nitrogen in nitrate of soda, sulfate of ammonia, and dried blood, with varying ratios of phosphoric acid and potash—season 1930, J. G. Lipman and A. W. Blair (*New Jersey Stas. Rpt. 1931, pp. 365–374, fig. 1*).—The following subjects of investigation have been continued from previous years (E. S. R., 65, p. 810): Buckwheat, 1930; continuous wheat and rye with and without a legume green manure crop, 1930; nitrogen in the green manure; and continuous growing of corn with a legume and a nonlegume green manure crop, 1930.

Availability to plants of potash in polyhalite, G. S. Fraps (*Texas Sta. Bul. 449 (1932), pp. 16, fig. 1*).—The potash content of polyhalite (about 12 per cent of the total mineral) showed itself water-soluble to the extent of 73.2 per cent of the total potash content of the mineral when the latter was ground to pass a 20-mesh sieve and examined by means of the A. O. A. C. method for potash in fertilizers. Polyhalite ground to pass a 10- but not a 20-mesh sieve was but 36.8 per cent water-soluble with reference to total potash content. The 20-mesh grade showed a potash availability 96 per cent of that of potassium sulfate or chloride in pot experiments, and is considered suitable for use as a fertilizer source of potassium.

The influence of phosphates on the phosphoric acid content of the plant, A. W. Blair and A. L. Prince (*Jour. Agr. Research [U. S.], 44 (1932), No. 7, pp. 579–590*).—Analyzing the results of cylinder experiments and field plat trials, some of which cover a period of more than 30 years, the authors of this contribution from the New Jersey Experiment Stations find that "light applications of superphosphate—100 to 250 lbs. an acre—did not, in most cases, materially influence the phosphoric acid content of the crop. With heavier applications—500 to 1,000 lbs. an acre—there was usually some increase in the phosphoric acid content of the dry matter. In some cases the increase was as much as 40 per cent. In the case of potatoes, increasing the amount of superphosphate applied seemed to have no influence on the phosphoric acid content of the crop."

Phosphoric acid determinations made on a limited number of samples of mixed herbage from plats with and without phosphate indicated that the phosphate treatment tends to increase the percentage of phosphoric acid in the hay. "However, attention is called to the fact that such increases may be due to changes in the type of vegetation which the phosphate treatment causes rather than actual increase in a specific plant."

The soils used varied from 0.1 to 0.8 per cent in their content of phosphoric acid. This variation in phosphorus content appeared to have little effect upon the phosphorus content of the crop, however, "since soybeans grown on Colts Neck loam containing 0.8 per cent phosphoric anhydride contained no more phosphoric acid than did those grown on Sassafras loam with about 0.1 per cent phosphoric anhydride." It is concluded that, in comparison with the effect of nitrogenous fertilisers on the nitrogen content of plants, the effect of phosphatic fertilisers on the phosphorus content is small.

American fertilizers, P. E. Howard (*U. S. Dept. Agr., Misc. Pub. 143 (1932), pp. 24, figs. 16*).—The paper gives a brief nontechnical description of the pro-

duction of commercial fertilizers. The primary topics taken up are soil exhaustion, plant food, fertilizer practices in the United States, fertilizer materials and their production, and fertilizer factories.

AGRICULTURAL BOTANY

Plant physiology (*New Jersey Stas. Rpt. 1931, pp. 52–55*).—The principal results of investigations on the iron distribution in plants, absorption of nitrogen in the forms of NH_4+ and NO_3- by tomato plants in cultures, and the nutritional requirements of the rhododendron are summarized.

Studies, by direct freezing and indirect methods, of cold resistance in winter cultures [trans. title], I. I. TUMANOW and I. N. BORODIN (*Phytopath. Ztschr., 1 (1929), No. 6, pp. 575–604, figs. 9*).—Studies are reported in considerable detail.

Frost resistance in winter wheat is related closely to the "hardening" by cold to which it has been subjected, as indicated by tabulations.

After hardening at a temperature of about 0° C., winter wheat endures well at a temperature of −10°, but it suffers at −12°. Only the most resistant varieties bear −15°, and no wheat variety bears −20° C., which is survived by winter rye.

Studies of cold resistance and susceptibility in corn, J. R. HOLBERT and W. L. BURLISON (*Phytopathology, 19 (1929), No. 1, pp. 105, 106*).—Wide variations in resistance to injury from cold in the fall were found in strains of corn as they approached maturity. Some were killed by a few hours' exposure to temperatures ranging from 45 to 50° F., while others withstood six hours of exposure from 32 to 30°. Similarly in the spring some strains escaped apparent injury as seedlings, 4 to 6 in. high, when exposed to temperatures as low as 25°, while other strains were severely injured.

[Method for determining the comparative hardiness of alfalfa seedlings] (*Nebraska Sta. Rpt. [1931], pp. 31, 32*).—This method is briefly described.

The water supply of the epidermis of leaves, C. D. LA RUE (*Mich. Acad. Sci., Arts, and Letters, Papers, 13 (1930), pp. 131–139*).—"It is possible for the epidermis of the leaves of a number of plants to secure an adequate supply of food and water without any connections with the mesophyll."

Resistance to wilting and drying [trans. title], I. I. TUMANOW (*Wiss. Arch. Landw., Abt. A, Pflanzenbau, 3 (1930), No. 3, pp. 389–419*).—An outline is given of experimentation in 1927 and 1928 to determine the operation of means possessed by such cultivated plants as oats and millet, with addition later of beans, maize, sorghum, soybeans, *Medicago sativa*, and *M. falcata*, to resist the effects of drought. The several plant organs differ in the degrees possessed of capability to resist drought. In the wilted state the plants usually dry very slowly. The process of drying is very complicated. In many plants the water deficit is distributed very unequally throughout the individual. Some organs are able to preserve their own lives at the expense of other organs. The influence of mineral fertilizer on resistance of plants to drying is unimportant. Oat plants in shade are less resistant than those in sunshine.

Permeability, E. GELLHORN (*Das Permeabilitätsproblem. Berlin: Julius Springer, 1929, pp. X+441, figs. 42*).—This monograph on the problem of permeability, especially as to its significance in physiology and general pathology, is in four main sections: Fundamentals; general, the permeability of the cell; special, the permeability of the organ; and data, including what has been ascertained as to the plasma membrane, permeability theories, and concluding remarks. An extensive alphabetical literature list and a subject index conclude this compact account.

Histochemical researches and permeability studies on agricultural seeds in regard to their germination biology [trans. title], A. NIETHAMMER (*Wiss. Arch. Landw., Abt. A, Pflanzenbau, 3 (1930), No. 3, pp. 321–348, figs. 14*).—By means of appropriate experimentation with dissolved coloring materials it has been found possible to ascertain the place, kind, amount, and manner of entrance of water and of solutes into seeds of *Lupinus albus*, *Pisum sativum*, *Vicia sativa*, *Trifolium pratense*, *Triticum sativum*, *Cannabis sativa*, *Linum usitatissimum*, *Solanum lycopersicum*, and *Allium cepa*, with similarities and differences.

Neither benefit nor injury is possible in case of failure of water to enter the living portions of the seeds. Whether stimulus or injury is to result is determined not only by the ion which enters but also by the biochemical characters of the seed. Uspulun and Germisan ordinarily do not enter the seed.

The determining influences of different plants, compositions, structures, conditions, and compounds are detailed.

Is light important immediately after germination? (*Jour. Forestry, 30 (1932), No. 4, pp. 509, 510*).—At the Lake States Forest Experiment Station marked differences were seen in corn seedlings which were germinated in full and weak light, the former growing much more rapidly and apparently being better able to utilize stored reserves. However, when the temperature was kept equal in both cultures there were no growth differences, leading to the conclusion that stronger light is likely beneficial simply because of its increasing effect on temperature.

Callusing of cotton stem cuttings, H. E. REA (*Plant Physiol., 5 (1930), No. 4, pp. 575–586, pl. 1; abs. in Texas Sta. Circ. 61 (1931), p. 17*).—A report is given of successful callusing experiments with cotton stem cuttings in glass jar propagators.

It was found that with softwood cuttings, treatment with solutions of potassium permanganate, the use of sphagnum moss as a propagating medium, and placing the propagators under low temperature were detrimental to callusing of cuttings. Cuttings callused as readily when used immediately or stored 12 hours, crowded or not crowded, and when cut smoothly or carelessly. Mature wood gave results superior to medium mature and softwood. Exposure of the base of the inverted cutting to moist air above soil materials appeared to provide good conditions for callusing. Houston black clay was more favorable to callusing than other soil materials used, whether the bases of the cuttings were covered or exposed.

Grafting experiments with cotton, H. E. REA (*Plant Physiol., 6 (1931), No. 1, pp. 193–196, fig. 1; abs. in Texas Sta. Circ. 61 (1931), p. 21*).—The author describes a method of asexual propagation of cotton plants that is considered adapted to the indefinite retention of parental types. By the use of the saddle-grafting method 70 per cent of the grafts was successful if made prior to 9 a. m., while very few grew when grafted during the heat of the day. A delay of one hour in placing the scion after it was cut reduced the percentage of success.

The rôle of acetaldehyde in plant metabolism, S. A. TROUT ([*Gt. Brit.*] *Dept. Sci. and Indus. Research, Food Invest. Bd. Rpt. 1930, pp. 64, 65*).—In view of the rarity or lack of study regarding the influence of acetaldehyde on plant respiration, the author adopted a technic supplying acetaldehyde vapor in concentrations ranging from 0.1 to 0.4 per cent by volume to normally respiring organisms, as apples and oranges.

At all temperatures respiration was markedly heightened by the treatment, the new rate remaining constant during its continuance but falling to normal on its discontinuance. These results are not at present considered safely

attributable to any single causation. Since no acetaldehyde could be detected by steam distillation of the fruit at the end of the experiments, it is supposable that the acetaldehyde is directly oxidized by oxidizing enzymes to carbon dioxide and water, or else that it is condensed to alcohol and acetic acid, the latter being oxidized to carbon dioxide and water.

Experimentation has proved that condensation does not occur, and a relationship has been established between acetaldehyde destruction and carbon dioxide output increase, the results suggesting the equation $CH_3CHO+5O \rightarrow 2\ CO_2+2\ H_2O$. Furthermore, it is said that under anaerobic conditions, acetaldehyde is not oxidized, but is converted into alcohol. Further experimentation is considered necessary to decide whether acetaldehyde is an intermediate of respiration in plant metabolism.

The effect of hydrogen cyanide on the metabolism of the potato, J. Barker (*[Gt. Brit.] Dept. Sci. and Indus. Research, Food Invest. Bd. Rpt. 1930, pp. 61–64, figs. 2*).—The work represented by this account is said to have been done in collaboration with C. S. Hanes and to have been included in a paper by Hanes and Barker read at the International Botanical Congress in 1930.

Cyanide has previously been found useful in the study of respiration, as it has a strong inhibiting effect on this function, which has been interpreted as a poisoning of the respiratory enzymes. In the present case, the physiological action of cyanide had a somewhat special interest, as it was desired to investigate the effects of cyanide upon plant tissues to determine whether the specific action on the starch-hydrolyzing system (bringing about a considerable activation of extracts of amylase from barley) could be reproduced in the living cell. The potato tuber was chosen as experimental material. The results are graphically represented, and it is claimed in summary that the changes in respiration produced by treating potatoes at 15° C. with hydrogen cyanide-air mixtures of moderate strengths are related mainly to the effect of cyanide on the sugar content. The rising phase of respiration corresponds with an increase in sugar content, the falling phase with a decrease.

"The work on barley amylase affords a basis for interpreting these changes in the sugar content. Cyanide has a dual effect on barley amylase, the initial activation being followed by an inactivation. If, then, a similar effect of cyanide on the starch-hydrolyzing mechanism of the potato is postulated, the increase of sugar content resulting from activation will be followed by a decrease as the inactivation proceeds. On this interpretation, the observed changes of respiration induced by treatment with moderate concentrations of cyanide are primarily due to the effect on the starch-hydrolyzing system in the potato.

"This study of the action of moderate strengths of cyanide on potatoes at 15° C. has thus revealed an effect which could not have been foreseen from the earlier work on animal tissues and unicellular plants, in which, as already noted, cyanide usually produces a strong inhibition of the respiration. The particular effect described here is, however, only one of a number of effects of cyanide on the potato. Some of these effects, and also the action of cyanide on other plant tissues, are now being investigated."

Stimulative effects of illuminating gas on trees, C. G. Deuber (*Science, 75 (1932), No. 1949, pp. 496, 497*).—In the progress of an investigation to determine symptoms of illuminating gas poisoning on shade trees that might be useful in the early spring in the detection of incipient gas injury, the author found that under certain conditions decided stimulation followed the gas treatments.

Small entire dormant trees, cuttings of shrubs, and tree seeds were subjected to illuminating gas and atmospheres containing from 10 to 40 per cent of gas by

volume. Marked stimulation in bud development and unfolding was observed on small dormant black and red oak and catalpa trees exposed for 24 and 48 hours in an atmosphere containing 20 per cent of gas. Buds inclosed in gas-filled test tubes for 1 or 2 days were stimulated in development, but when the inclosure was prolonged to 4 and 8 days development was either inhibited or the buds killed.

When the roots of dormant black and red oaks were washed free of soil and sealed in an atmosphere of gas, the stems and buds being exposed to greenhouse air, the buds were activated in growth by as much as 3 or 4 weeks over check trees in greenhouse air. When soil-free roots of foliaged oak trees were sealed in gas for 1 day and then repotted, there was a slight wilting of the leaves followed by a recovery. Injurious effects were noted if the treatment was prolonged for 2, 3, and 7 days. Fifteen minutes' exposure to an atmosphere of gas hastened flower and leaf bud development of Forsythia and lilac. Longer exposures inhibited the growth or killed the terminal buds.

Dormant acorns of red, scarlet, and black oaks were subjected to atmospheres of gas for periods of from 6 hours to 4 days. There was a slight slowing down in the germination of the red oak acorns exposed for the longest periods. Black oak acorns were distinctly hastened in their germination by the longest exposures to illuminating gas.

The investigation is being continued to determine the constituents in gas that caused the stimulation.

Effect of thallium on growth of tobacco plants, J. E. McMurtrey, Jr. (*Science, 76 (1932), No. 1960, p. 86*).—A report is given on the effect of thallium on the growth of the tobacco plant. Plants were grown in three typical sandy loam soils in which thallium nitrate was added at the rate of 35 and 75 parts per million. The pots were held at two levels of soil moisture.

The injurious effect of the treatment was most noticeable at the higher moisture content. In many instances the stems of the plants were killed at the surface of the soil, possibly because the material was applied in solution and did not leach to any considerable extent from the surface.

In solution cultures 1 part per million of thallium either killed the plants outright or it slowed down growth and produced symptoms of chlorosis in the earlier stages of growth. The possible relation of the earlier symptoms of thallium injury to typical frenching is discussed.

Calculations of bioelectric potentials.—I, Effects of KCl and NaCl on Nitella, W. J. V. Osterhout (*Jour. Gen. Physiol., 13 (1930), No. 6, pp. 715–732, figs. 4*).—In this paper the chemical and concentration effects of potassium chloride and sodium chloride in Nitella are examined with a view to mathematical treatment. The experiments were performed on *N. flexilis* at a temperature of 19 to 20° C. according to the technic previously described (E. S. R., 64, p. 327).

"In this connection we need not detail all the features which must exist in a nonliving model before it can be called completely satisfactory, but it may be desirable to emphasize certain fundamentals. (1) The surface of a growing cell must admit both anions and cations or undissociated molecules of electrolytes. . . . (2) Subjecting normal cells of Nitella or Valonia to an electric current produces a series of effects (e. g., back e. m. f. with direct current, falling off of impedance as a function of the frequency with alternating current) not imitated by collodion or by amyl alcohol or other nonliving models except perhaps by metallic electrodes. (3) In many cases the protoplasmic surface undergoes great and rapid changes in permeability with complete or partial recovery which have not yet been satisfactorily imitated by any model.

"In view of these and other complications the question of a model appears to need further investigation."

Cytological action of X-rays [trans. title], S. LALLEMAND (*Bul. Soc. Bot. France, 77 (1930), No. 3-4, pp. 192-196*).—The effects were studied and are herein detailed of the exposure of *Allium cepa* rootlets during different periods of time to graduated dosages over a wide range of X-ray emanation.

Three successive phases are detailed as following the irradiation. An increase of dosage markedly diminishes the number of mitoses.

Dosage in irradiation of roots of Allium cepa [trans. title], S. LALLEMAND (*Bul. Soc. Bot. France, 77 (1930), No. 5-6, pp. 274, 275*).—Details are given regarding cytological changes and growth following the application of X-rays to roots of *A. cepa*, also as to dosage proving indifferent, injurious, or fatal.

Pathological effects of uranium radiation on Olea europaea [trans. title], L. PETRI (*Phytopath. Ztschr., 1 (1929), No. 1, pp. 45-48, figs. 2*).—Olive plantlets only a few days old were subjected to radiation from uranium oxide, and the results on growth and on activity as lessened transpiration are herein set forth and interpreted to indicate a lowering of the life activity of the living plant due to the irradiation.

Determining the identity of mycorrhiza-forming fungi, R. E. MCARDLE (*Mich. Acad. Sci., Arts, and Letters, Papers, 13 (1930), pp. 159-164*).—Microscopic sections of 28 fungus fruit bodies with attached mycorrhizal rootlets were examined microscopically to ascertain whether the apparent attachment of fruit bodies indicated a real connection with the interior of the roots, thus proving that these fungi are mycorrhiza formers. The mycelium of the fruit body could not be traced to the interior of the mycorrhizal rootlets, and that inside, as well as that in the fungal mantle, differed decidedly from that composing the fruit body.

"Although circumstantial evidence is often very strong, the apparent attachment of fruit bodies to tree roots can not be taken as proof that the fungus forming the fruit body likewise formed the mycorrhiza. Proof of this must be established through microscopic investigation."

GENETICS

[Genetics studies in California] (*California Sta. Rpt. 1931, pp. 43, 44, 45, 74-76*).—Work with Crepis (E. S. R., 65, p. 724) reported on was centered on efforts to increase the number of species under investigation and on the study of interspecific hybrids. The genetics of *C. dioscoridis* is also discussed briefly.

Brief reports are given of work with horticultural plants, including the occurrence of apogamy in citrus species and varieties; the tree and fruit characters in nonhybrid tetraploid forms of citrus; trisomic inheritance in Matthiola and Lycopersicum; the nature of inheritance of the delayed foliation character in the peach; and the duration of viability in peach pollen.

Account of the research in progress in the British Empire (*Cambridge: Imp. Bur. Plant Genetics, 1932, pp. [12]+90*).—This multigraphed compilation lists the genetic and improvement work in progress with field crops, vegetables, fruits, and oil, rubber, and condimental plants in the several dominions and other divisions of the British Empire.

Mutation in Ustilago zeae, E. C. STAKMAN, J. J. CHRISTENSEN, and W. F. HANNA (*Phytopathology, 19 (1929), No. 1, p. 106*).—The authors report about 100 different mutants of *U. zeae* produced by 1 monosporidial line and more than 70 mutants by another line within a period of 9 months. The mutants differed from the parents and from each other in various characters.

The chromosome number in crowngall and cancer tissues, M. LEVINE (*Phytopathology, 19 (1929), No. 1, p. 97*).—Studies of chromosome numbers in crown galls of *Beta vulgaris* and *Nicotiana glutinosa* showed a considerably greater number of chromosomes in diseased than in normal plants.

Chromosome behavior in triploid Petunia hybrids, W. C. STEERE (*Amer. Jour. Bot., 19 (1932), No. 4, pp. 340–357, pls. 3, fig. 1*).—In this study at the University of Michigan reciprocal crosses made between a tetraploid race of *P. hybrida* (n=14) and a diploid species, *P. axillaris* (n=7), resulted in one case (the diploid used as ovule parent) in all diploid progeny, and in the other case (the tetraploid used as ovule parent) in triploid progeny having 21 somatic chromosomes. The triploids were about intermediate in appearance between the two parents, except that two plants were noticeably smaller than either parent. At the reduction division triploids normally exhibited a complete association of all the chromosomes into sets of three. A considerable portion of the pollen of the triploids was found sterile, due in part to microcytes arising from chromosomes which lagged or became isolated during meiosis and in part to cells which did not contain a complete or functional set of chromosomes.

A new case of unlike reciprocal hybrids in Aquilegia, M. SKALIŃSKA (*5. Internatl. Bot. Cong., Cambridge, 1930, Rpt. Proc., p. 250*).—The author found that hybrids from reciprocal crosses between *A. flabellata nana* and *A. truncata* were unlike with respect to flower size and fertility and suggests that the result is probably due to differences in the cytoplasm of the two species. With *A. flabellata nana* as mother, the F_1 seedlings were almost completely pollen sterile and only from 13 to 23 per cent ovule fertile. The reciprocal hybrids possessed a much higher degree of fertility in both kinds of sex cells.

The genetic demonstration of double strand crossing-over in Zea mays, M. M. RHOADES (*Natl. Acad. Sci. Proc., 18 (1932), No. 7, pp. 481–484*).—The occurrence of double strand crossing over in corn was demonstrated genetically at Cornell University in studies utilizing *pr—r₂* trisomic strains isolated by B. McClintock.

Hybridization of maize, Tripsacum, and Euchlaena, P. C. MANGELSDORF and R. G. REEVES (*Jour. Heredity, 22 (1931), No. 11, pp. 328–343, figs. 10; abs. in Texas Sta. Circ. 61 (1931), pp. 26, 27*).—Certain phases of the study of crosses between varieties of corn and Tripsacum have been noted earlier (E. S. R., 63, p. 436; 66, p. 23). Crosses between teosinte (*E. mexicana*) and Tripsacum were made, but no viable, mature seed were obtained.

A rye-wheat hybrid, R. P. BLEDSOE (*Jour. Heredity, 23 (1932), No. 4, pp. 181–185, figs. 3*).—The F_1 rye × wheat plant described from studies at the Georgia Experiment Station closely resembled those of Meister and Tjumjakoff (E. S. R., 60, p. 429). The head characters in both cases were predominantly wheat yet markedly modified by the rye, and the heads were similar to those of the reciprocal cross. The vegetative characters, however, were rye-like, a difference possibly due to the heterozygous character of both parents rather than to any maternal inheritance.

Cytology and genetics of crosses between fourteen- and seven-chromosome species of wheat, W. P. THOMPSON (*Genetics, 16 (1931), No. 4, pp. 309–324, figs. 8*).—Crosses between emmer group wheats (*Triticum turgidum* and *T. durum*) (n=14) and *T. monococcum* (n=7) grown at the University of Saskatchewan were studied cytologically in F_2 and F_3 at the University of California. No plant in F_2 had fewer than 26 somatic chromosomes; most had from 27 to 30 and a few had 35 to 42. There was much nonconjunction, varying widely in the mother cells of the same plant and especially from plant

to plant. F_1 gametes with fewer than 13 chromosomes did not function, the successful gametes having approximately 14 or 21. Restitution of a single nucleus with 21 chromosomes following the homotypic division sometimes occurred. A hexaploid wheat not resembling common hexaploids was produced by crossing a tetraploid and a diploid. Although segregates with chromosome numbers approaching that of *T. monococcum* were absent, each *monococcum* character appeared in a considerable proportion of F_2. The emmer group characters were carried chiefly in the 7 chromosomes pairing with those of *T. monococcum*.

A fertile tetraploid tomato cross-sterile with diploid species, E. W. Lindstrom (*Jour. Heredity, 23 (1932), No. 3, pp. 115–121, figs. 3*).—Fertile tetraploids obtained asexually from normally diploid *Lycopersicum pimpinellifolium* plants as the result of shoot formation from callus tissue following decapitation were found self-fertile but completely cross-sterile with their parent and also with the common garden tomato. In a broad sense these tetraploids might be classed as new species.

The genetics and cytology of "rogues" in tomato, an ever-sporting character, C. L. Huskins and M. B. Crane (*5. Internatl. Bot. Cong., Cambridge, 1930, Rpt. Proc., pp. 198, 199*).—Cytological examination of the rogues in a tomato population showed that one member (or both) of a pair of chromosomes is frequently fragmented, or at least has its segments very widely separated. This phenomenon was very rarely if ever observed in the Potato Leaf tomato, a variety observed to produce no rogues.

Hybridity in the genus Lilium, D. Griffiths (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 62–66*).—A discussion is presented of parental combinations that have been found successful in the Lilium genus, with suggestions as to potentially productive lines of breeding that might be followed by investigators.

The occurrence and cytology of triploid, aneuploid, and partially sterile individuals among roses in the section Cinnamomeae, E. W. Erlanson (*5. Internatl. Bot. Cong., Cambridge, 1930, Rpt. Proc., pp. 223, 224*).—Among 185 roses belonging to the section Cinnamomeae-Carolinae examined at the University of Michigan there were found 6 triploids, 6 aneuploids, and 17 with a balanced chromosome complement. The triploids are believed to have arisen from crosses between diploid and tetraploid species and the aneuploids from nondisjunction or nonconjunction of the chromosomes. From cytological and cultural studies the author concludes that American roses are nearly all heterozygous, and that spontaneous hybridism is still taking place.

Pollen-tube behaviour in self-incompatibility, A. B. Stout (*5. Internatl. Bot. Cong., Cambridge, 1930, Rpt. Proc., pp. 255, 256*).—The path and the behavior of the germinating pollen tubes of *Brassica pekinensis*, Hemerocallis, and Lilium are briefly discussed.

Genes in maize for pollen sterility, G. W. Beadle (*Genetics, 17 (1932), No. 4, pp. 413–431, figs. 8*).—Fifteen genes with pollen sterility characters, in all of which the development of megaspores and female gametophytes is normal, were studied at Cornell University and the California Institute of Technology. In the character variable sterile-2 (va_2) as in variable sterile-1, cytokinesis often failed to be completed during meiosis. A gene termed warty anther (*wa*) was reported. In *wa* plants the very young microsporocytes degenerate in certain regions of the anther, but develop normally in other regions.

The 13 additional genes for male sterility reported were named male sterile-4 to -16, inclusive, with the symbols ms_4 to ms_{16}, respectively. Intercrosses showed that with a possible exception genes concerned in the production of these male sterile characters are nonallelomorphic. The male steriles are

characterized cytologically by degeneration of the microsporocytes or of the microspore cells. The time of degeneration may be the same or different in different male steriles and ranges from the synizetic stage of meiosis almost to pollen maturity.

An additional pair of factors affecting anthocyanin pigment in maize, M. T. JENKINS (*Jour. Agr. Research [U. S.], 44 (1932), No. 6, pp. 495–502, fig. 1*).—A new gene, A_2a_2, affecting the production of anthocyanin pigment in corn, isolated from Iodent corn in cooperative studies by the Iowa Experiment Station and the U. S. Department of Agriculture, is similar in action, both in aleurone and in plant color, to the *Aa* (here designated A_1a_1) factor pair isolated by Emerson (E. S. R., 40, p. 436). A_2a_2 was found to be complementary to the A_1a_1, *Cc*, and *Rr* pairs in the production of aluerone color and to A_1a_1 in the production of plant color. It differed from A_1a_1 only in that it has no influence upon the color produced by the pericarp gene *P*. Cob color appeared to depend upon the color of the lower and the upper glumes of the cob. The color of the lower glumes seemed to be controlled by the plant color genes and not to be influenced by the pericarp gene *P*. The color of the thin upper glumes or chaff is influenced by *P*, but not by A_2a_2.

The inheritance of colored scutellums in maize, G. F. SPRAGUE (*U. S. Dept. Agr., Tech. Bul. 292 (1932), pp. 44, pl. 1*).—The pigments of colored scutellums in corn were found most abundantly in the envelope of the scutellar aleurone grains. The related colors purple and red are described as dominant to the absence of color with the exception of one dominant white, while orange and yellow scutellums are recessive to white. In progenies segregating for orange and yellow and for purple or red, orange and yellow scutellums can be determined with accuracy only among the nonpurple and nonred classes.

Purple and red scutellums, normally exhibited only in the presence of purple and red aleurone, were shown to depend upon the interaction of four factor pairs, S_1s_1, S_2s_2, S_3s_3, and S_4s_4, S_1 being indispensable. S_1 in combination with any two other members of the series will result in colored scutellums. Colorless scutellums appeared to require the dominant member of the factor pairs *It* or S_4s_4, or recessive s_1, or at least two of the pairs S_2s_2, S_3s_3, and S_4s_4 in a recessive condition. There was some evidence of linkage between S_1 and *Su*. Dominant white scutellums were found due to the action of the S_4s_4 or *It* pairs. *Orange scutellums were observed to develop in the presence of* so_1 so_1, so_2 so_2. One factor for orange scutellums, so_1, is linked either with the *A* or *R* aleurone factor. Yellow scutellums *Sy sy* were inherited as a simple Mendelian recessive. The residual genetic mass was shown to be the factor determining whether 9 : 7 or 15 : 1 ratios were to result from crosses involving the same two segregating factor pairs.

Inheritance of chlorophyll characters in sorghum, R. E. KARPER and A. B. CONNER (*Genetics, 16 (1931), No. 4, pp. 291–308, figs. 2; abs. in Texas Sta. Circ. 61 (1931), pp. 17, 18*).—The principal observations have been noted from another source (E. S. R., 66, p. 22).

The inheritance of the White Burley character in tobacco, F. S. HENIKA (*Jour. Agr. Research [U. S.], 44 (1932), No. 6, pp. 477–493, fig. 1*).—The inheritance of the chlorophyll-deficient White Burley character in crosses of White Burley with normal green tobaccos was studied at the Wisconsin Experiment Station.

According to data from the F_1, F_2, and F_3 generations and from back-crosses of F_1 and F_2, duplicate genes, G_1 and G_2, are involved in the production of the normal green color, and their recessive allelomorphs g_1 and g_2 are both essential to the White Burley genotype. F_1 plants were fully green, and segregation in

F_2 was accordingly 15 green : 1 white. In F_3 true-breeding green and true-breeding white progenies were recovered as well as families segregating for one and for two factors. Large recessive deficiencies in field plantings, and smaller but equally distinct recessive deficiencies in greenhouse plantings, observed in all segregating generations, seemed due to a differential viability between dominant green and recessive white genotypes. A special technic for the identification of the White Burley character in greenhouse seedlings was developed.

Sheep breeding experiments (*New Hampshire Sta. Bul. 262 (1932), p. 11*).—Studies of inbreeding in sheep, by E. G. Ritzman, showed that fertility and growth rate were lowered by bringing out the expression of recessive characters. Crossbreeding permitted carrying these factors without their expression.

FIELD CROPS

[Agronomic experiments in California] (*California Sta. Rpt. 1931, pp. 53, 54, 55, 56, 61, 62*).—Further progress (E. S. R., 65, p. 727) is again reported from breeding work with cowpeas for forage and green manure, vetch, sour clover, Hopi Lima beans, and grain sorghum, and with sugar beets for nonbolting and resistance to curly top; purification of varieties of barley, wheat, and oats; fertilization of small grains following sorghums; variety trials with rice and with vetch and peas sown with Kanota oats for hay; a survey of grain sorghum varieties in California; and cutting experiments with alfalfa.

[Field crops work of the Connecticut State Station] (*Connecticut State Sta. Bul. 337 (1932), pp. 472, 473, 475, 476, 481, 482, 484*).—Agronomic activities reported on comprised variety trials with corn for silage, comparison of large and small corn kernels for seed, and the derivation of dioecious corn; and tobacco research bearing upon the determination of the critical growing period, corn gluten meal as a nitrogen source, and strains of root rot-resistant Havana seed tobacco.

[Field crop research in Florida], G. E. Ritchey, W. E. Stokes, W. A. Leukel, J. D. Warner, E. F. Grossman, F. H. Hull, J. P. Camp, M. R. Ensign, A. Daane, R. V. Allison, R. A. Bourne, F. D. Stevens, W. A. Carver, and L. O. Gratz (*Florida Sta. Rpt. 1931, pp. 33–47, 100–104, 139, 140, 144–146, 154, 155, 163–171, 181–184, figs. 3*).—Agronomic work (E. S. R., 65, p. 429) again reported on from the station and substations comprised breeding work with corn, sweet corn, cotton, peanuts, sugarcane, and Bahia grass; induction of mutations by heating seed corn; variety trials with cotton, sorgo, sugarcane, millet, Crotalaria, miscellaneous forage, pasture, and lawn grasses, and winter cover crops; variety-date-of-planting tests with cowpeas and soybeans; fertilizer tests with corn, oats, rye, wheat, cotton, peanuts, sugarcane, potatoes, and tobacco; treatment of peanut varieties with land plaster; cultural (including planting) trials with corn, cotton, and potatoes; photoperiodism, sprouting, and storage experiments with potatoes; a paper mulch test with sweetpotatoes; and crop rotations. Pasture investigations were concerned with competition, carrying capacity, effects of fertilizers and frequency of cutting on yield and composition of grasses, and comparisons of native v. improved, burned v. unburned pastures, and of methods of preparing land before seeding; fertilizer and lysimeter studies with pasture grasses; and the growth behavior of Bahia grass and influence of different fertilizer formulas on its yields. Certain studies were in cooperation with the U. S. Department of Agriculture.

[Crop experiments in Indiana] (*Indiana Sta. Rpt. 1931, pp. 9–12, 13, 54, figs. 2*).—Field crops work again (E. S. R., 65, p. 124) reviewed briefly included

comparisons of crop rotations and studies of the effects of preceding crops on yields of following crops, row fertilization and fertilizer placement tests with corn, a fermentation time test of quality in wheat, and variety, seeding, and utilization studies with soybeans.

[Field crops experiments in Maryland] (*Maryland Sta. Rpt. 1931, pp. XV–XVII, XVIII, XXVII*).—Agronomic work reviewed included variety tests with corn for grain and silage (E. S. R., 66, p. 427), wheat, and oats, and soybeans for hay and seed; fertilizer experiments with corn and tobacco; and rotations and breeding work with tobacco.

[Field crops work in Nebraska] (*Nebraska Sta. Rpt. [1931], pp. 14–18, 33, 34, 40, 41, 44, 46*).—Continued investigations (E. S. R., 65, p. 822) with field crops reported on from the station and substations included variety tests with oats, barley, spring and winter wheat, corn, sorgo, alfalfa, soybeans, and miscellaneous forage crops; breeding work with corn, wheat, barley, and alfalfa, selection of potatoes for seed purposes and a study of degeneracy in seed potato stocks; cultivation (including planting) tests with potatoes, sorghum, soybeans, and forage crops; source of seed tests and curing studies with alfalfa (E. S. R., 65, p. 129); crop rotation and fertilizer experiments involving corn, wheat, and oats; rotation and tillage studies on dry land; rotation under irrigation; and meadow improvement work. Certain lines of work were in cooperation with the U. S. Department of Agriculture.

[Crops experiments in New Hampshire] (*New Hampshire Sta. Bul. 262 (1932), pp. 10, 11*).—Fertilizer trials with potatoes and a fertilizer placement test with corn, both by F. W. Taylor, and a time of cutting experiment for hay by F. S. Prince and P. T. Blood are reported on briefly.

[Agronomic experiments in New Jersey], J. G. LIPMAN and H. B. SPRAGUE (*New Jersey Stas. Rpt. 1931, pp. 18–21, 351–364*).—Research with field crops (E. S. R., 65, p. 824) included improvement work with corn, wheat, rye, oats, barley, alfalfa, red clover, and Jerusalem-artichoke; variety (E. S. R., 67, p. 127) tests with these crops, potatoes, clover, timothy, and annual hay crops (E. S. R., 67, p. 378); planting trials with rye and potatoes; a study of the extent of the corn root system on different soil types; comparisons of cover and green manure crops in corn; the effect of X-ray treatment of potatoes on the development, yield, and mutation; fertilizer trials with Jerusalem-artichoke and pasture; weed control in pastures; and turf investigations involving species of grass, fertilizers, lime and organic-matter treatments, and soil textures.

Field experiments in agronomy (*Ohio Sta. Spec. Circ. 38 (1932), pp. 77, figs. 5*).—Similar in scope to an earlier publication (E. S. R., 63, p. 525), this circular tabulates the results of variety and cultural (including planting) tests with corn, wheat, oats, barley, soybeans, alfalfa, sweetclover, and red clover; trials of spring grains and summer annual forage crops, oats-barley mixtures, soybeans with corn and with Sudan grass, and crop combinations for hay; cutting tests with alfalfa and sweetclover; and harvesting and fertilizer placement studies with corn. The response of different crops to crop rotation, fertilizers, manure, and lime, and the results of experiments on the establishment, fertilization, and management of lawns also are summarized for various periods.

[Field crops work in Puerto Rico in 1931], T. B. MCCLELLAND and R. L. DAVIS (*Porto Rico Sta. Rpt. 1931, pp. 6, 8, 9, 13–18, 19–22, figs. 3*).—Breeding work, trials of seedlings, hybrids, and introduced varieties, and refractometer tests, all with sugarcane; breeding work with corn and yams; fertilizer tests with dasheens, taros, and yautias; and trials of varieties of Crotalaria, beans, and pigeon peas are reviewed (E. S. R., 66, p. 527) for 1931.

[Agronomic investigations in the Virgin Islands, 1931], J. B. RICKS, C. L. HORN, and C. B. DOYLE (*Virgin Islands Sta. Rpt. 1931, pp. 6, 7, 11, 15, 16, fig. 1*).—These pages describe trials of grasses and other pasture plants, efforts to control hurricane grass, and sweetpotato storage studies; give analyses of Barbados sour grass and hurricane grass; and include a report on cotton-growing possibilities in St. Croix.

Annual forage crops under irrigation, J. E. NORTON (*Montana Sta. Bul. 261 (1932), pp. 17, figs. 6*).—Of the annual forage crops of minor importance grown under irrigation, corn did not appear generally to be well adapted to the agriculture of western Montana, except in the lower irrigated valleys. It was inferior to alfalfa, small grain hay, and sunflowers in certain respects. Adapted strains of Gehu, Dakota White Flint, and Northwestern Dent are indicated where corn is desired. For hog pasture rape was not so good as alfalfa but surpassed other annual crops such as oats or barley. Dwarf Essex rape and Thousand Headed kale differed little in their adaptation to the irrigated districts of western Montana. Field peas produced good yields of hay in the section, but the general culture of alfalfa and the high price of seed limits their use for this purpose. Arthur was the best late-maturing pea, and Bangalia, Golden Vine, and White Canada were high-yielding, early peas. Millets, although of minor importance, have a place as an annual or emergency hay crop, whereas Sudan grass and soybeans were of little consequence in the agriculture of the region.

Imperial Bureau of Plant Genetics: Herbage plants (*Imp. Bur. Plant Genet., Herb. Plants [Aberystwyth], Buls. 1 (1930), pp. 22; 2 (1930), pp. 24; 3 (1931), pp. 77, pls. 3, figs. 2; 4 (1931), pp. 40; 5 (1931), pp. 52; 6 (1932), pp. 32, figs. 3*).—The bulletins in this series are entitled (1) Miscellaneous Information Relating to Breeding of Herbage Plants, (2) Miscellaneous Information Relating to Herbage Plants, (3) The Breeding of Herbage Plants: Technique Adopted at the Welsh Plant Breeding Station, (4) Abstract-Review of Lucerne Literature during Period 1925–30, (5) Research in Progress on Herbage Plants, Forage Crops, and General Grassland Problems in the British Empire, and (6) Research on Forage Crops in Soviet Central Asia, with Special Reference to Turkestan Lucerne.

Crested wheatgrass as compared with bromegrass, slender wheatgrass, and other hay and pasture crops for the northern Great Plains, H. L. WESTOVER, J. T. SARVIS, L. MOOMAW, G. W. MORGAN, J. C. THYSELL, and M. A. BELL (*U. S. Dept. Agr., Tech. Bul. 307 (1932), pp. 36, figs. 10*).—The history, description, characteristics, adaptation and cultural requirements, utilization, and seed production of crested wheatgrass are described from studies made in cooperation with the Montana, North Dakota, and Wyoming Experiment Stations. The composition of the crop, production and viability of the seed, and diseases are discussed briefly.

Crested wheatgrass (*Agropyron cristatum*), a native of the cold, dry plains of Russia and Siberia, is a perennial bunch grass closely related to slender wheatgrass (*A. tenerum*) and western wheatgrass (*A. smithii*), and is characterized by a long productive life, ability to grow at lower temperatures than other grasses adapted to the same general condition, and a tendency to become dormant during hot dry periods.

The grass seems especially well adapted to the northern Great Plains, where temperatures are severe and the moisture supply limited, and it thrives on productive soils of almost any texture. Cultural practices indicated as favoring the crop include a firm, fine seed bed well supplied with moisture, and sowing about the time of planting spring wheat, in close drills, especially for hay or

pasture, or in cultivated rows and preferably without nurse crops. Close-drilled fields do not need attention in the year planted, while row seedlings require cultivation to suppress weeds.

Analyses of crested wheatgrass at various growth stages showed a somewhat higher protein content than in bromegrass or slender wheatgrass. When grown in rows it contained more protein than when grown in close drills. As to palatability and quality, crested wheatgrass compared most favorably with other grasses utilized for hay in the northern Great Plains.

Crested wheatgrass generally yielded somewhat better than bromegrass or slender wheatgrass in comparative tests over about 15 years. The other two grasses often yield more the first two or three years, after which slender wheatgrass seems to die out and bromegrass becomes sod bound, while the crested wheatgrass continues to produce satisfactorily if moisture conditions are favorable. The ability of crested wheatgrass to grow at lower temperatures than other cultivated grasses permits it to furnish pasturage earlier in the spring and later in the fall. It at least equals other grasses generally grown in the northern Great Plains in carrying capacity. Crested wheatgrass does not yield so much hay as alfalfa where moisture conditions favor alfalfa, but it often yields more where the moisture supply is limited. Where it can be sown in mixture with alfalfa to advantage the mixture often outyields either crop grown alone.

Composition of the fiber and waste of Agave lechuguilla, R. A. GREENE (*Bot. Gaz., 93 (1932), No. 4, pp. 484–491*).—The fiber and waste of *A. lechuguilla* were analyzed at the Arizona Experiment Station and were found similar in composition to those of *A. americana*. There appeared to be no profitable industrial uses for either the fiber or waste under present conditions, although locally the waste might be used as a cattle food by removing the saponin or returned to the soil as fertilizer.

Correlations of certain lint characters in cotton and their practical application, G. N. STROMAN (*Jour. Agr. Research [U. S.], 44 (1932), No. 6, pp. 523–527*).—The correlation relationship between lint percentage, lint index, boll weight, and length of lint is reported on for nine sister families of cotton studied at the New Mexico Experiment Station. These families sprang from a hybrid plant, probably an upland-Egyptian cross. The data are discussed from the viewpoints of genetics and of the practical breeder. Lint percentage and lint lengths are considered especially in relation to the other characters and their practical importance is indicated.

Effects on cotton of irregular distribution of fertilizers, A. L. MEHRING and G. A. CUMINGS (*Jour. Agr. Research [U. S.], 44 (1932), No. 7, pp. 559–570, figs. 4*).—In a study reported previously (E. S. R., 63, p. 482), ordinary and concentrated fertilizers were applied for cotton at rates of 800 and 267 lbs. per acre, respectively, uniformly by hand and with five typical degrees of irregular distribution by commercial distributors in narrow bands 2 in. below the seed in Norfolk coarse sand and Cecil sandy clay loam.

Statistical analysis of measurements of the crops produced indicated that a larger number of seed germinate promptly, but that the seedlings are more irregularly spaced along the row, when fertilizers are applied irregularly than when they are distributed uniformly. Uniform applications produced faster and more uniform growth, earlier blooms, earlier maturity, and larger yields of cotton than did irregular applications. The extent of these effects was decidedly significant and varied with the degree of irregularity of distribution.

Later aspects of the general study have been noted elsewhere (E. S. R., 66, p. 427).

Oat production in Alaska, F. L. Higgins (*Alaska Stas. Bul. 10 (1932), pp. 18, figs. 6*).—The climatic, soil, cultural, fertility, rotation, and harvesting requirements of oats in Alaska are described from station experiments and experience, with information on varieties, smut and weed control, and the history of the crop in the Territory.

Tuber development in Triumph potatoes as influenced by time of planting on dry land in northwestern Nebraska, H. O. Werner (*Nebraska Sta. Research Bul. 61 (1932), pp. 46, figs. 11*).—Triumph potatoes were planted on dry land in Box Butte County on four dates from mid May until late June or early July from 1925 to 1930, inclusive. Compared with the later plantings, the earlier plantings were characterized by quicker emergence, greater final stands, fewer stems and tubers per hill, heaviest tubers and highest percentage of heavy tubers when conditions were favorable early in the summer, low weight: length and thickness : length ratios, generally less cracking at harvest, more common and pitted scab, and in general higher yields, and the tubers lost less weight in storage. Early blight caused serious damage to May and early June plantings when rainfall was high early in the summer, and *Fusarium eumartii* and *F. oxysporum* were most prevalent in early plantings. In several seasons Rhizoctonia caused damage to late plantings by late-season stem and stolon girdling. The most desirable planting time for securing maximum yields of scab-free and marketable-sized potatoes appeared to be between June 15 and 20; if common scab is not likely to be serious, between June 5 and 15; and if scab is certain to be severe, after June 20.

Multiple seeded spikelets in sorghum, R. E. Karper (*Amer. Jour. Bot., 18 (1931), No. 3, pp. 189–194, figs. 2; abs. in Texas Sta. Circ. 61 (1931), p. 20*).—These pages describe in greater detail the multiple seeded spikelets found by the Texas Experiment Station to occur quite often in milo (E. S. R., 66, p. 22). The similarity of the series of abnormal spikelets to those found by others in *Zea mays* is commented on.

A study of sampling technic with sugar beets, F. R. Immer (*Jour. Agr. Research [U. S.], 44 (1932), No. 8, pp. 633–647*).—Sampling technic was studied in relation to the determination of sugar percentage in sugar beets by the U. S. Department of Agriculture cooperating with the Minnesota Experiment Station. Ten rows of Pioneer beets chosen for sampling were each 10 plats (33 ft.) in length, separated from one another by 3 intervening rows. The plats were separated on the ends by 2-ft. alleys. The area could be considered a 10-by-10-plat field, each plat consisting of 4 rows, only one of which was sampled. Ten beets were so selected from each plat that the entire length of the row was sampled uniformly, and the sugar percentage in the pulp of each beet was determined by the cold-water digestion method. The data were subjected to the analysis of variance devised by Fisher (E. S. R., 50, p. 234).

The regression of sugar percentage on the weight of roots was not entirely linear; 92 per cent of the quadratic regression could be explained in terms of the linear function. The soil heterogeneity between plats was found to affect sugar percentages significantly, even when the effect of weight was held constant by the regression relationship. Tables show the number of beets per plat needed to reduce the standard error of the mean to 0.3, 0.2, and 0.1 per cent sugar for various sizes of plats and numbers of replications. It is pointed out that the variability in sugar percentage between plats and within plats must be considered in estimating the size of sample required and the number of replications needed to reduce the standard error to a given level. The standard error of the mean of total sugar per beet was somewhat lower than that for weight and much higher than that for sugar percentage. The variability in

sugar percentage between plats was essentially the same whether calculated from the mean of 10 beets analyzed individually or from a composite sample of the same number.

Size and shape of plot in relation to field experiments with sugar beets, F. R. IMMER (*Jour. Agr. Research* [*U. S.*], *44* (*1932*), *No. 8, pp. 649–668, figs. 4*).—Using data from the same field as in the study noted above, size and shape of plat in relation to field experiments with sugar beets were studied, and the relationship determined between weight, sugar percentage, and apparent purity.

The area harvested after border rows and the ends of the field were removed consisted of 60 rows 350 ft. long, each row subdivided into 10 plats each 2 rods long, with 2-ft. alleys between, and beets about 1 ft. apart in the row. When the crop was lifted a sample of 10 beets was taken from each ultimate unit (1 row 2 rods long) at uniform intervals over the entire length of the row. Sugar percentage and apparent purity were determined from the juice extracted by a hydraulic press from the sample, and the yield was determined from the sample plus the remaining beets. The analysis of variance method devised by Fisher (E. S. R., 50, p. 234) was used in analyzing the data.

Increased size of plat in general was accompanied by decrease in standard errors, expressed as percentage of the mean. A greater standard error from 6-row plats than from 3- or 4-row plats when the entire plat was harvested was accounted for by soil heterogeneity. The efficiency in use of land decreased with increased size of plat when the entire plat was harvested; when the border rows of the plats were removed 4-row plats were most efficient. The weight of beets was significantly correlated negatively with sugar percentage but not with apparent purity, while sugar percentage was highly correlated positively with apparent purity. Intraplat regression and correlation coefficients are given. Sugar percentage was found to vary significantly from plat to plat apart from its relation to weight; and 54 per cent of the variability in apparent purity between plats was due to factors that affected sugar percentage as well. Fairly narrow plats, either 2 or 4 rods long, would appear to be the most economical size and shape in agronomic experiments with sugar beets.

Sugar cane fertilization in Porto Rico, I. A. COLÓN (*Amer. Fert.*, 77 (*1932*), *Nos. 1, pp. 9, 10, 26, 28; 2, pp. 13, 28, 30, 32*).—A review is given of fertilizer investigations with sugarcane in Puerto Rico by the experiment stations and other agencies.

Softening of the seeds of Melilotus alba, D. H. HAMLY (*Bot. Gaz.*, *93* (*1932*), *No. 4, pp. 345–375, pls. 2, figs. 4*).—The impermeable region of the seed coat of white sweetclover (*M. alba*), according to studies at the University of Toronto, is formed by a layer of tightly appressed suberin caps. The hard and soft seeds could be distinguished in the unswollen condition by the use of osmic acid. The permeability of naturally soft seeds was observed to occur through the opening of a cleft at the strophiole. This strophiolar cleft could be produced by moderate heating or by mechanical impacting. Soft-seededness appeared to be an irreversible condition.

Choosing your variety of winter wheat, C. A. LAMB (*Ohio Sta. Bimo. Bul. 157* (*1932*), *pp. 145–151*).—Variety tests indicated Fulhio wheat for most of Ohio, Trumbull on the heavy and more acid soils in the northeastern quarter of the State, and Nabob and Gladden in certain localities.

Timely hints on wheat seeding and seedbed preparation, L. E. THATCHER (*Ohio Sta. Bimo. Bul. 157* (*1932*), *pp. 140–145*).—The higher yields of wheat in extensive tests were obtained from early seed bed preparation (plowing) and planting about 8 pk. per acre in the period September 20 to 25. Weak-strawed wheats should be sown at the rate of about 6 pk. per acre on rich land, and

about 8 pk. per acre if in the fall or on medium-fertile land; stiff-strawed varieties 8 to 10 pk.; and wheat as a nurse crop for alfalfa 5 to 6 pk. per acre.

Effect of plant nutrition on the composition of wheat, H. R. Kraybill (*Cereal Chem., 9 (1932), No. 1, pp. 71–82*).—This review of literature embracing 31 titles discusses the development of the wheat kernel; the effect of nutrition and climatic factors on the composition of wheat; the effect of nitrogen, potash, and phosphorus fertilizers; and the effect of nitrogen upon quality.

Seed inspection, F. A. McLaughlin and M. E. Nagle (*Massachusetts Sta. Control Ser. Bul. 62 (1932), pp. 47, fig. 1*).—The purity, weed seed content, and germination are tabulated for 469 official samples of agricultural seed collected in Massachusetts during the year ended October 1, 1931. Samples of alfalfa, red clover, sweetclover, onion, and garden pea seed were also tested for trueness to type and variety. The presence and occurrence of seed-borne diseases in peas are also shown.

Proceedings of the twenty-first annual meeting of the Association of Official Seed Analysts of North America (*Assoc. Off. Seed Anal. North Amer. Proc., 21 (1928–29), pp. 64*).—A report of the activities of the association during 1928 and of the twenty-first annual meeting at New York City, from December 31, 1928, to January 2, 1929. The following papers are included: Reasonable Tolerance for Minor Impurities in Seed Testing, by W. D. Hay (pp. 18–21); Changes in the Weights and Percentage Composition of Seed Samples under Laboratory Conditions, by E. P. Emack (pp. 21, 22); Problems Encountered in the Analyzing of Orchard Grass Seed, by M. E. Woodbridge (p. 23); Factors Causing Low Germination in Sorghum Seed, by B. J. Thornton (pp. 23–26); Broken Seeds of Cereals, by M. E. Lyon (pp. 26, 27); Relation of Plumpness and Viability of Color [of Alfalfa Seed], by J. C. Ayres (p. 28); Beet Seed Treatment for Disinfection Purposes, by J. A. Small (pp. 28, 29); Some Practical Aspects of Seed-Borne Disease Determinations (p. 29) and The Report of the International Seed Testing Association: Report of the Fifth International Congress, Rome, Italy, May 16–19, 1928 (pp. 50–53), both by M. T. Munn; Physiology of Seed Germination, by W. Crocker (pp. 29–35); Results of a Study of *Daucus carota* Seeds, by O. M. Hoefle (pp. 35, 36); Methods of Germinating New Zealand Spinach (pp. 36, 37) and Germination Equipment Recently Installed in the Virginia Laboratory (pp. 37–41), both by C. M. Bass; Ideals and Seed Testing, by E. H. Toole (pp. 41–43); Comparative Analyses of Sweet Clover by American and European Methods, by A. Frisak (pp. 43–47); Some Problems Involved in Attempting to Compare Results from European and American Methods, by O. A. Stevens (pp. 48–50); Correlation of Hard Seed Content and Plants Produced in Field (pp. 53–60) and The Problem of Interpreting the Value of Hard Seeds in Small Seeded Legumes (pp. 60–62), both by W. O. Whitcomb; and The Comparative Value of Scarified and Unscarified Sweet Clover Seed (p. 62) and The Agricultural Value of Hard Seeds of Sweet Clover under Alberta Conditions (p. 63), both by C. W. Leggatt.

General seed bibliography, W. J. Franck and W. H. Bruijning (*Wageningen: Internatl. Seed Testing Assoc., Com. Pub. and Registr., 1931, pts. 1–2, pp. XCI+632*).—Prepared for members of the International Seed Testing Association, this mimeographed publication comprises extensive lists of references grouped as to the botany and chemistry of seeds; seed production, including seed-borne diseases and seed treatments; seed testing, control, regulations, and distribution; different kinds of seeds; and the technological use of seeds and seed products. Tables of contents in English, German, French, Danish, Italian, and Dutch, and lists of authors are also provided. See also a similar publication on germination of seed (E. S. R., 62, p. 834).

The puncture vine in California. E. JOHNSON (*California Sta. Bul. 528* (*1932*), *pp. 42, figs. 11*).—The origin, distribution, characteristics, and life history of puncture vine (*Tribulus terrestris*) (E. S. R., 47, p. 234; 55, p. 741; 59, pp. 332, 736; 60, p. 336) are described; its damage to crops, land, livestock, and persons is indicated; and accounts are given of growth and germination studies and experiments on mechanical and chemical methods of control.

In the control methods recommended the puncture vine is first treated with Diesel oil to kill the seeds, if present, without disturbing the vines. Whenever young plants appear and before the burs form, they are cut off just below the crown or sprayed with oil or any cheap chemical weed killer. The sprouting of seeds remaining in the soil is encouraged by frequent irrigation during the summer. Mature burs should not be plowed under. Composting of infested manure is suggested for the destruction of puncture vine seed.

HORTICULTURE

[**Horticulture at the Connecticut State Station**] (*Connecticut State Sta. Bul. 337* (*1932*), *pp. 453, 470–472, 473–475, 476, 486, figs. 4*).—Data are reported on the results of a determination of arsenical residues on sprayed apples; pure line and recombination breeding of sweet corn; varietal testing of vegetables, particularly peppers, spinach, lettuce, beets, carrots, squash, and tomatoes; raspberry and strawberry breeding; fertilizer experiments with dahlias and zinnias; and the growing of dwarf apples.

[**Horticultural investigations at the Florida Station**] (*Florida Sta. Rpt. 1931, pp. 58–61, 87–100, 124–127, 141–143, 146–149, figs. 4*).—Information is presented on the results of fertilizer studies with Satsuma oranges, Valencia oranges, Marsh grapefruit, and pecans conducted by R. W. Ruprecht; on cold storage studies with grapefruit, oranges, orange juice, youngberries, and Missionary strawberries; on chemical studies of oranges and grapefruits grown on rough lemon and sour stocks and effects of soil temperature on germination of citrus seeds, by A. F. Camp; on the testing of citrus hybrids and species as rootstocks, by H. Mowry; on the relation of nitrogen absorption and storage to growth and reproduction of citrus and pecans, by Camp and G. H. Blackmon; on varietal, fertilizer, and cover crop tests with pecans, by Blackmon; on the testing of ornamentals and fruits and on the propagation and culture of tung-oil trees, by Mowry; on avocado maturity tests, by A. L. Stahl; on results secured by J. H. Jefferies at the Citrus Experiment Station on citrus progeny and bud selection, propagation, and citrus variety tests; on cover crops and green manure studies in citrus groves, by W. E. Stokes and Jefferies; and on varietal studies of various fruits and fertilizer studies with vegetables, by R. V. Allison at the Everglades Experiment Station.

[**Horticulture at the Indiana Station**] (*Indiana Sta. Rpt. 1931, pp. 40, 41–44, 51, 52, 53, 54, 55, figs. 2*).—Brief comments are given on the results of dusting and spraying trials; on the cost of stationary spraying; on peach pruning and fertilization studies; on peach varieties; on apple storage; on wilt-resistant strains of asters; on manurial substitutes in the greenhouse; on the selection of wilt-resistant tomatoes; on the effect of sterilization on the color of canned tomatoes; on canning tests with pumpkins and squash; on the use of electric light in the greenhouse; on the effect of cultural treatment on the chemical composition of apple trees; on the quantity of arsenic residue on apples; on substitutes for lead arsenate as a spray; and on the relation of chemical composition of pumpkins to their canning quality.

[**Horticulture at the Maryland Station**] (*Maryland Sta. Rpt. 1931, pp. XVII, XXIV, XXV*).—Brief comments are presented on the yields of tomatoes

variously fertilized; on the results of rejuvenation experiments with peaches; on the effects of nitrogen and potash on the color and keeping quality of apples; on attempts to regulate biennial bearing; on peach, apple, and strawberry fertilizer trials; on the influence of pollination on fruit yields; on the value of bees in pollination; and on the heating of hotbeds by electricity.

[**Horticulture at the Nebraska Station**] (*Nebraska Sta. Rpt.* [*1931*], *pp. 20, 21, 43*).—Brief progress reports are presented on the results of pruning experiments with apples; breeding experiments with plums; cultural studies with vegetables; rootstock and propagation investigations with various fruits; and trials at the North Platte Substation of various conifers, deciduous trees, and ornamentals.

[**Horticulture at the New Hampshire Station**] (*New Hampshire Sta. Bul. 262* (*1932*), *pp. 16–20, 21, 22*).—Information is presented on the results of fertilizer studies with apples, conducted by G. F. Potter; on changes in stored McIntosh and Baldwin apples, by E. J. Rasmussen; on pollination studies with apples, by L. P. Latimer; on apple washing studies, by Potter and G. P. Percival; on strawberry fertilizer studies, by Latimer; on breeding studies with popcorn, tomatoes, muskmelons, and sweet corn, by J. R. Hepler; on cultural studies with Iceberg lettuce; and on observations on blueberry production, by Latimer.

[**Horticulture at the New Jersey Stations**] (*New Jersey Stas. Rpt. 1931, pp. 36–43, 45–47, 199–205, 255–305, 375–377, figs. 4*).—This report presents information on the results of studies in calcium nutrition of tomatoes (E. S. R., 66, p. 828); the occurrence and rôle of reducase in the apple tree, by S. H. Eckerson; the chemistry, histology, and cytology of the cranberry plant and its associated mycorrhiza, by R. M. Addoms and F. C. Mounce; spray residue investigations, including fruit washing equipment and injuries resulting from washing; the results of cranberry and blueberry fertilizer studies and of the growth of blueberry roots and tops, by C. S. Beckwith and C. A. Doehlert; on peach seedling distribution, peach propagation, flower types in peach seedlings, number of fruit buds set, length of internodes, and number of buds per node in different peach varieties; growth studies of the Delicious, Stayman Winesap, and Rome Beauty apples; effects of the 1930 drought on size of apples; and blooming data on various fruits and ornamentals, all by M. A. Blake; on pollination and pollen viability studies with apples and peaches; control of the raspberry crown borer; nature of noninfectious chlorosis of the strawberry; results of strawberry breeding; length of fruit developmental period in strawberries, grapes, and raspberries; and varietal tests of small fruits, all by J. H. Clark; phenological notes on shrubs, by C. H. Connors; sand culture studies with carnations and roses, by H. M. Biekart and Connors; the germination of seeds of annuals, by R. B. Farnham; on fertilizer studies with asparagus; breeding of asparagus and tomatoes; use of glass substitutes; and the growth of vegetables in sand cultures, all by L. G. Schermerhorn and W. R. Robbins; and on the results of the cooperative sweet corn fertilizer experiments in Burlington County conducted by A. W. Blair and L. L. Lee.

Horticulture at the Ohio Agricultural Experiment Station, 1932–1933 (*Ohio Sta. Spec. Circ. 41* (*1932*), *pp. 32, figs. 9*).—This consists of general statements by J. H. Gourley et al. concerning horticultural work in progress, with information as to the results of fertilizer experiments with fruits; variety tests of various fruits and vegetables; pruning, thinning, pollination, and cultural trials with various fruits; chemical studies of apple fruits; strain tests with cabbage and tomatoes; selection studies with beets; breeding investigations with sweet corn; fertilizer studies with vegetables; storage tests of vegetables; the effect of holding tomato plants in pots after reaching plant-

ing size; varietal, fertilizer, and cultural studies with potatoes; and propagation, soil reaction, fertilizer, and light studies with ornamentals.

[Horticulture at the Puerto Rico Station], T. B. McClelland, [illegible] and H. C. Henricksen (*Porto Rico Sta. Rpt. 1931, pp. 6–8, 18, 19,* [illegible]).—Results are presented of fertilizer studies with coffee at Las Vega, [illegible] ductory work with avocados and mangoes, of breeding work with [illegible], of the growth of citrus roots in different soils, upon the loss of fertilizers by leaching, on the results of attempts to influence the time of blooming in the pineapple, and on the utilization and preparation of bay oil.

[Horticulture at the Virgin Islands Station], C. L. Horn (*Virgin Islands Sta. Rpt. 1931, pp. 10, 11*).—A brief report is given on the results of citrus rootstock tests, the value of iron sulfate for preventing chlorosis in pineapples, on the curing of sweetpotatoes, and variety tests with avocados.

[Olericulture at the California Station] (*California Sta. Rpt. 1931, pp. 62–64, 97–102*).—Brief notes are presented on the results of experiments on the relation of temperature at the time of fertilization to the germination of carrot seed; the relation of the point of origin of carrot seed to its viability; thresher injury to baby Lima bean seeds; changes occurring in the composition of garden peas during their development; the chemical composition of globe artichoke roots; spacing and cultural trials with asparagus; variety tests with beets; the breeding of crucifers, such as cabbage and broccoli, cantaloupes, and celery; the development of onions resistant to pink root; the breeding of stocks and larkspur; natural crossing in peppers; and on the improvement of tomatoes and watermelons.

The vegetables of New York, Vol. 1, pt. 2: Beans, U. P. Hedrick, W. T. Tapley, G. P. Van Eseltine, and W. D. Enzie (*New York State Sta., 1931, pp. III+110, pls. 39, fig. 1*).—This, the second (E. S. R., 61, p. 640) in this series of monographs, discusses the history and botany of garden beans and presents descriptions of varieties, with special reference to pods and seeds, many of the more important varieties being illustrated in color.

Thresher injury in baby Lima beans, H. A. Borthwick (*Jour. Agr. Research [U. S.], 44 (1932), No. 6, pp. 503–510, figs. 5*).—In a study at the California Experiment Station of several hundred baby Lima bean seedlings grown from machine-threshed seed, there were observed several different types of injury, the more important of which are illustrated and described. That such injuries were the result of threshing was manifested in the fact that hand-shelled beans showed no injury whatsoever to the radicle and hypocotyl and much less frequent injury to the cotyledons and plumules.

Inheritance of color in the eggplant (Solanum melongena L.), J. A. B. Nolla (*Jour. Dept. Agr. Puerto Rico, 16 (1932), No. 1, pp. 19–30, pls. 6*).—In crossing a native eggplant of undesirable appearance but of considerable resistance to bacterial wilt with improved varieties, such as Black Beauty and New York Improved, the author observed that green color of fruit was always associated with green color of plants and that purple, red, and pink fruits were always borne on purple colored plants. Red, purple, and pink color of fruit was dominant to green, and was inherited in a 3:1 ratio. Violet or purple corollas were dominant over white, segregating in a 3:1 ratio in the F_2 generation. Apparent complete linkage existed between white corolla and nonstriped anthers and between green fruit and green plant color. Striped anthers were always associated with bright colored fruits and purple plants.

[Pomology at the California Station] (*California Sta. Rpt. 1931, pp. 40–42, 43, 44, 87–92, 96, 97, 105–108*).—The results are presented of studies at the Citrus Experiment Station upon the fertilizer requirements of Washington

Navel oranges; the effects of adding organic matter on the nitrogen-carbon [illegible] soil; the nitrate content of treated soils; the effects of broadcasting [illegible] on mottled Valencia orange and grapefruit trees; the effect of [illegible]ments on the time of maturity of oranges; thinning oranges in [illegible] of fruit; the propagation and inarching of lemons and oranges; [illegible] and prevention of dying of bud shoots in citrus nurseries; the re-[illegible] original size of nursery trees to subsequent growth and fruiting; the [illegible]ous rootstocks for citrus; the use of water by walnut trees; changes [illegible] in ripening pears, apples, and other fruits; the cause of splitting of peach pits; the nature of gumming in the Phillips peach; the physiology of alternate bearing in Sugar prunes; the relation of temperature to successful apricot and pear growing; the cause of die-back in prune trees; phosphorus nutrition in peach and apple trees on low phosphorus soils; the pollination of peaches and nectarines; effect of cover crops on nitrate nitrogen in orchards; the control of little leaf in fruit trees; starch accumulation and cambial activity in citrus, fig, olive, walnut, and avocado wood; the value of pruning in correcting the undesirable effects of wind on persimmon trees; the testing of a large number of grapes and apricots imported from northern Africa; testing grape seedlings; grape breeding; pruning, thinning, and rootstock studies with the grape; the effect of girdling grapes on the composition of the tissues above the wounds; olive pruning and olive spacing; the relation between the time of harvest and the composition of prunes; the canning of prunes and peaches; the shipping of dried fruit to the Orient; and walnut dehydration.

Comparisons of various methods of spraying, H. A. Cardinell and H. P. Gaston (*Michigan Sta. Spec. Bul. 220 (1932), pp. 25, figs. 14*).—A comparison of five different methods of spraying in an orchard near Fennville, containing large blocks of Baldwin and King apples set out in 1881 and some 15-year-old Jonathans, led to the deduction that good commercial control of pests can be obtained by any of the commonly used methods, provided reasonable care is taken with respect to timeliness and thoroughness.

Up to 500 lbs. of pressure there was a tendency to apply more spray material per tree as operating pressures were increased, while beyond this point there was a decline in amount. A range of from 300 to 400 lbs. pressure is conceded most satisfactory. Heavily pruned trees required less spray material than lightly pruned trees, but with modern equipment successful pest control is conceded possible irrespective of pruning.

No significant difference was found in pest control or spray injury whether the trees were sprayed during the day or at night. Dusting was performed much more rapidly than spraying and gave essentially as good results at somewhat lower cost. An auxiliary tank for hauling water was beneficial with respect to rate and cost of spraying when the source of water was distant.

Spray and other deposits on fruit, L. R. Streeter, P. J. Chapman, S. W. Harman, and G. W. Pearce (*New York State Sta. Bul. 611 (1932), pp. 19, figs. 5*).—Results of arsenical residue determinations in 1930 and 1931 showed some increase above the preceding 2-year period (E. S. R., 62, p. 740), due apparently to more thorough spraying and to dry weather in these two years. Studying the distribution of the arsenic on the apples, it was found that 39 per cent of the total was in the calyx and stem ends. Acid washes were found more effective than brushing or wiping in arsenic removal. Aphis and leafhopper deposits increased the difficulty of cleaning. None of several types of cleaning tried had any material effect on keeping quality of the apples. The addition of hydrated lime to lead arsenate spray facilitated cleaning to some extent. Calcium arsenate was much less adhesive than lead arsenate, but

because of its greater burning tendency can not be generally substituted. Various problems asociated with fruit cleaning, such as choice of washing solutions, etc., are discussed.

Amount and variability of spray residue on New Hamps[illegible] G. P. PERCIVAL and G. F. POTTER (*New Hampshire Sta. Tech.* [illegible] *pp. 15*).—Baldwin apples harvested at the regular picking sta[illegible] trees receiving (1) two cover sprays of arsenate of lead, (2) [illegible] of arsenate of lead, (3) two cover sprays of calcium arsenate[illegible] cover spray of calcium arsenate were analyzed for arsenic resi[illegible] basis of about 50 fruits per sample and each fruit analysed separate[illegible] fruit, and that from the two-cover lead arsenate plat, exceeded the world tolerance of 0.01 grain of arsenious trioxide per pound of fruit.

In 1928, when three cover sprays of both insecticides were used in place of the two, a considerable percentage of the apples, 23.4 per cent in the case of the three lead arsenate sprays and 12.78 per cent in the case of the three calcium arsenate, exceeded the tolerance.

In 1929, with the same spray program used in 1927 but with rainfall greatly decreased, the percentage of apples exceeding the tolerance was greatly increased, reaching a maximum of 56 per cent in the case of the two lead arsenate cover sprays and 32 per cent with a single lead arsenate spray.

When apples were picked from different heights on the tree those from the top third were much lower in percentage of fruit exceeding the tolerance. Where apples were taken from four different sides of the tree there was found no material difference in arsenical residue. Determinations of the lead residue in 1927 showed a strong correlation, 0.599 ± 0.045, between lead and arsenical residues.

In concluding the authors point out that the date of the last application and the amount of rain falling between the last spray and harvest are factors of maximum importance in determining whether or not arsenical residues will be sufficiently great to necessitate the washing of the fruit. The authors suggest that residues should be kept down to three-fourths of the tolerance to offset the ordinary errors in determinations arising from the manner of sampling.

Light and pigment development in apples, L. R. STREETER and G. W. PEARCE (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 49–52, fig. 1*).—Mature McIntosh apples with only traces of red color were exposed at the New York State Experiment Station to sunlight passing through various filters and glasses. Since color developed under those glasses having a transmission range of from 3,000 to 7,000 a. u. and very little under those of the range 4,400 to 7,000 a. u., the authors suggest that the effective range must lie below 4,400 a. u., and the optimum for coloring McIntosh apples in October and November is suggested to be in the vicinity of 4,100 a. u.

Apples exposed to the light of a 1,500-w Mazda lamp after passing through an inch of running water designed to remove heat changed from almost no red color to almost complete color in from 5 to 6 days. Apples which had been kept in a cellar storage at 45° F. for 3 months colored somewhat but not to the extent of freshly harvested fruit.

Some relationships between tree response and internal composition of shoots of the peach, F. P. CULLINAN (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 1–5*).—Determinations at the Indiana Experiment Station of the dry weight, soluble and insoluble nitrogen, reducing sugars, sucrose, and starch in the terminal shoots of Elberta peach trees growing on plats receiving different amounts of nitrogen showed some marked differences in composition attribut-

able to nitrogen treatment. In all cases where nitrogen was applied either before or after bloom higher nitrogen content was found in the new growth. Six weeks after petal fall the shoot growth of the unfertilized trees was higher in dry weight and starch and lower in soluble and insoluble nitrogen than were those from fertilized trees. Starch reached a maximum in both nitrogen and nonnitrogen shoots in September but was higher in the latter. December samples showed slightly more starch in the high nitrogen trees. In the dormant season following a noncrop year, total nitrogen was nearly as high and in some cases higher in the terminal shoots of the nonnitrogen trees. Terminals gathered 2 weeks after a −5° F. freeze showed 45 per cent of bud killing on the long terminals of nonnitrogen trees as compared with 18 per cent on similar shoots of the high nitrogen trees. Since the only marked difference in composition was a higher percentage of reducing sugars in the high nitrogen shoots, the author is unable to explain the greater resistance to freezing on a chemical basis. Apparently factors promoting greater resistance lie within or near the bud itself.

Preliminary report on relation of soil moisture and leaf area to fruit development of the Georgia Belle peach, I. D. JONES (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 6–14, figs. 4*).—In studies conducted by the North Carolina Experiment Station in the sand-hill area, it was found that increases in leaf-to-fruit ratio on ringed branches increased the size of fruits and to a limited extent hastened maturity. In the case of trees growing in soils of different moisture content, fruits supported by similar leaf areas were larger in the case of the higher soil moistures. This relation was found to hold in both ringed and nonringed branches. The tree responded to reduced soil moisture by shortening the period in which the leaf stomata were open. Under normal conditions the stomata opened very soon after exposure to the direct sun. Rains occurring in dry periods lengthened the period of stomatal opening, thus indicating that the effective leaf surface is influenced by the amount of available soil moisture.

The relation of leaf area per peach to physical properties and chemical composition, E. L. OVERHOLSER and L. L. CLAYPOOL (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 15–17*).—Measurements at the Prosser branch of the Washington College Experiment Station of the fruits of early Elberta trees thinned on June 12 to provide 35, 50, 65, 95, and 125 leaves per fruit showed a gradual increase in size with the greater number of leaves up to about 80 to 85 per peach. A tendency on the part of unringed branches to produce smaller fruits with 105 leaves is explained on the basis that there was insufficient fruit to serve as moisture reservoirs for the leaves during periods of high transpiration. On unringed branches the average areas per leaf were 34.9 and 26.8 cm^2, respectively, with 25 and 105 leaves. On ringed branches the leaves were very uniform in size, irrespective of the number per fruit.

Chemical composition was not found to be greatly influenced by the number of leaves per fruit, but there was noted a tendency in both ringed and unringed branches for total sugars and sucrose to increase and for nitrogen and water to decrease as the number of leaves was increased. The percentages of acid, reducing sugars, and alcohol-insoluble-acid-hydrolyzable materials fluctuated, but in no certain direction.

The relation of leaf area to size and quality of peaches, J. H. WEINBERGER (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 18–22, fig. 1*).—Observations on fruits of ringed branches of 20-year-old Elberta and Late Crawford trees so thinned that each fruit had 5, 10, 20, 30, 40, 50, and 75 leaves showed definite increased size up to the maximum number of leaves. In Late Crawford there

was a tendency for the curve to flatten out at the upper limits, indicating that a smaller gain was obtained from corresponding leaf areas. Forty or more leaves were required to develop high quality. In the Elberta, fruits with 5, 10, 50, and 75 leaves contained 5.4, 7.6, 8.8, and 9 per cent of sugar. Acidity was highest at both ends of the leaf range. Similar observations were made on Late Crawford. The percentage of dry material in terms of fresh weight increased with the leaf area per fruit. Under the conditions of the study, from 30 to 40 leaves per fruit were found most desirable when size and quality of the fruit and the future performance of the tree were considered.

Some vegetative responses of the peach to applications of nitrate of soda, T. E. Ashley (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 28–33*).—Measurements at the Mississippi Experiment Station of the shoot growth of moderately vigorous 6-year-old Elberta trees to which were applied 0, 6, and 12 lbs. of nitrate of soda showed an increase in length in accord with the amount of nitrogen applied. The 6-lb. treatment gave the most shoots and the greatest number of short shoots, and the 12-lb. the greatest length of shoots, the most shoots over 12 in. in length, the most secondary shoots, and the greatest average shoot length.

The percentage and amount of water-soluble and total nitrogen per unit length of shoot increased and the percentage and amount of starch decreased as the rate of application of nitrogen increased. Leaf area and the percentage and amount per leaf of both water-soluble and total nitrogen in the leaves increased with the rate of application of nitrogen.

Some fruiting responses of the peach to applications of nitrate of soda, R. V. Lott (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 23–27*).—Pressure readings taken at the Mississippi Experiment Station on fruits from 6-year-old Elberta trees supplied with 0, 3, 6, 9, and 12 lbs. of nitrate of soda per tree in addition to a basic application of superphosphate and potassium sulfate showed only slight differences in firmness. However, significant differences were noted in the time of ripening, the larger the application of nitrogen the later the maturity. Significant differences were also recorded between readings on five different positions on the fruit, the order of firmness being left cheek, right cheek, suture, opposite suture, and apex, indicating the need of selecting a definite position when making comparative readings.

Preliminary report of effects of time and rate of nitrate fertilization on growth and yield of Elberta peaches, J. H. Beaumont and C. F. Williams (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 34–38, figs. 2*).—Working with Elberta trees 8 years old at the beginning of the study, the North Carolina Experiment Station found that both the time and rate of application of nitrogen were factors in promoting growth and fruiting, particularly the latter. In every case yields were proportional to the earliness of application. As to quantity, 6 lbs. of nitrate of soda was not outstandingly better than 3 lbs. In respect to effect on the time of maturity of peaches, both March and May applications delayed maturity in proportion to the amount applied, but the effect was greater in the May applications.

Seasonal variations in nitrogen concentration in twigs of peach trees under sandhills conditions, C. F. Williams (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 39–44, figs. 5*).—Analyses at the North Carolina Experiment Station of the terminal growth of bearing Elberta trees fertilized with nitrate of soda in March, May, and August showed that early applications increased the percentage of total nitrogen early in the season, but that in August all three treatments reached approximately the same minimum. When different amounts

of nitrate of soda were applied in March, the percentage of total nitrogen in the shoots in April and May was proportional to the rate of application. If a supplementary application was made in May, the difference in total nitrogen in the shoots continued until August. Where less than 1.5 lbs. of nitrate of soda was applied before harvest or where 3 lbs. were applied in March and none in May, the increase in percentage of total nitrogen in the shoots after harvest was more rapid than where the application was 3 lbs. or more. In only two cases where the percentage of nitrogen in November was 0.995 or more was there any decrease in nitrogen in January. This decrease is considered due to the translocation within the tree rather than to utilization.

Two species hybrids, C. O. SMITH (*Jour. Heredity, 23 (1932), No. 4, pp. 166–172, figs. 5*).—In this contribution from the Citrus Experiment Station at Riverside, Calif., dealing with hybrids of the Saucer peach of possible value as ornamentals, descriptions are presented of two natural hybrids, one resulting from a cross between *Amygdalus persica platycarpa* and *A. communis* and the other between *A. mira* and *A. persica*. Both are recommended for trial as ornamentals because of their large flowers, dark green, vigorous foliage, and freedom from delayed foliation.

Studies on the effect of chemical fertilizers upon growth and fruit production of the black raspberry, W. F. CHERRY (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 176–179*).—At the Indiana Experiment Station, Cumberland and Plum Farmer black raspberry plants growing in a loam soil to which was applied 40 tons per acre of manure as a basic treatment responded to supplemental fertilizers, especially superphosphate and ammonium sulfate. The highest yields were secured where ammonium sulfate was used in combination with phosphorus or potash. All of the three elements, nitrogen, phosphorus, and potash, increased yields.

Analyses of sample canes cut July 15 and December 10, 1930, showed much higher average amounts of total carbohydrates during the dormant season. Chemical differences were not correlated apparently with yield differences, but there was a definite relationship between yield and size of berries and diameter of canes. Sugars tended to be somewhat higher in plants receiving sulfate of potash than in the other treatments.

Notes on the fall flowering habit of the red raspberry, W. G. BRIERLEY (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 180, 181*).—A few instances are cited where flowers and even fruits were observed on the young canes of the Cuthbert raspberry in late autumn, and lead to the question as to the frequency of this phenomenon, its connection with environment, etc.

Growth studies in the Latham raspberry, W. G. BRIERLEY (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 182–187, figs. 3*).—Measurements at the University of Minnesota of the fruiting laterals and of the young canes of the Latham raspberry during the hot, dry summer of 1931 showed quite parallel growth curves until the development of flowers and fruit. A decline in rate of growth of fruiting laterals in early June was accompanied by an acceleration in growth of young canes, suggesting an interrelation. The rapid resumption of growth after heavy rains led to the conclusion that the red raspberry is very sensitive to variations in the moisture supply of the soil.

Transpiration in new and old canes of the Latham raspberry, W. G. BRIERLEY (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 188–193*).—Hourly readings taken at the University of Minnesota upon the volume of water used by excised old and young canes of the Latham raspberry placed in the greenhouse in sealed potometers showed a somewhat higher transpiration rate per unit increase of leaf area during the first portion of the day in the young canes.

After 3 p. m. the situation was slightly reversed, leading to the suggestion that stomatal regulation may be more sensitive in the younger leaves.

In other experiments, where transpiration was measured by attaching small bottles of calcium chloride to the lower and upper surfaces of leaves, it was found that the rate for the lower surfaces ranged from 2 to 15 times that of the upper surfaces. There was also a tendency for the transpiration rate of the lower surface to be greater near the cane tips than below. The transpiration rate of lower leaf surfaces of old canes was less than that of new canes as the season progressed.

Maturity tests for table grapes, A. J. Winkler (*California Sta. Bul. 529* (*1932*), *pp. 35, figs. 3*).—On the basis of tests in which more than 3,000 samples of the leading table grapes were first scored for eating quality and then examined for sugar and acid contents, the author concludes that neither percentage of acid nor degrees Balling when used alone is a satisfactory index to grape maturity but that the Balling-acid ratio of the expressed juice obtained by dividing the degrees Balling by the percentage of acidity is satisfactory.

The influence of regional conditions on the composition and palatability of grapes was evident in a comparison of samples from the three important producing sections, namely, the Coachella and Imperial Valleys, Kern County, and the Fresno-to-Davis region. Fruit of the same degree Balling was considerably higher in acidity in the Fresno-to-Davis section than in the other two. The influence of differences in seasonal temperatures on composition and palatability corresponded with the differences in the several regions. In cool seasons acidity was relatively high in relation to sugar. A means for determining the maturity of table grapes by using the degrees Balling and the Balling-acid ratio of the expressed juice is discussed.

The lateral root spread of the fig tree, H. P. Traub and R. H. Stansel (*Amer. Soc. Hort. Sci. Proc., 27* (*1930*), *pp. 109–113, fig. 1; abs. in Texas Sta. Circ. 61* (*1931*), *pp. 23, 24*).—Asserting that the root system of the fig may be characterized as a "fibrous" type with long slender laterals, the authors state that 5- to 6-year-old Magnolia fig trees at the Angleton Substation had a root spread of 50 ft.; a single lateral reached a distance of over 35 ft. from the main trunk. In the planning of fertilizer experiments with figs, it is suggested that at least two buffer rows be placed between differential treatments. Means of preventing root spread over longer distances in the case of trees older than those studied are indicated.

A study of the influences of defoliation and pinching back on young mulberry trees in the nursery.—I, The influences of defoliation [trans. title], Y. Kishi and S. Monose (*Bul. Sci. Fakult. Terkult., Kjûsû Imp. Univ., Fukuoka, Japan, 5* (*1932*), *No. 1, pp. 60–81, figs. 2; Eng. abs., pp. 79–81*).—Observations on young mulberry trees following defoliation showed a percentage increase in water and ash and a decline in total nitrogen and carbohydrates in proportion to the degree of defoliation.

Effect of selection within apogamic and clonal progenies, H. J. Webber (*Amer. Soc. Hort. Sci. Proc., 28* (*1931*), *pp. 53–56*).—Stating that apogamic citrus progenies exhibit considerable variability with respect to size of seedlings, the author reports briefly on the results of studies at the Citrus Experiment Station, Riverside, Calif., upon budded progenies from selected trees of various species and varieties. With 10 per cent of the seedlings discarded at the beginning because of inferior size and with off types discarded at time of budding, variability in size at 3 years, as shown by the area of the cross section of the trunk at 4 in., was large. The coefficients of variation follow: Sweet orange 35.7±2 to 40.2±2.3, sour orange 26.9±1.4 to 28.8±1.1, and grapefruit

63.4±3.7 to 77±4.7. The figures for Cunningham and Savage citranges and the Sampson tangelo progenies were 23.9±0.9, 26.7±0.9, and 91±6.1, respectively, despite the fact that all three are normally 100 per cent apogamic. Rough lemon, supposedly of hybrid origin, had in one progeny a coefficient of variability of 90.2±6.4. The data show a very great variability with monoparental genetic types, and the results are ascribed to original differences in embryo size, in the time of growth initiation, and to environment.

Observations on the growth of trees on seedlings of homogeneous apogamic origin showed that larger seedlings in general produce somewhat larger and more productive trees. Though the differences tend to disappear, they were noted up to the close of 8 years in the orchard.

The economic importance of apogamy in Citrus and Mangifera, H. J. Webber (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 57–61*).—The range of percentage of apogamic embryos observed at the Citrus Experiment Station, Riverside, Calif., was 40 to 95, 75 to 85, 60 to 95, 10 to 100, 10 to 96, 40 to 50, and 72, respectively, for sweet orange, sour orange, grapefruit, Mandarin orange, lemon, citron, and trifoliate orange. The Sampson tangelo is conceded to be 100 per cent apogamic under ordinary conditions. The author suggests that by eliminating variants from seedling progenies of individual trees of apogamic species the fertilized progeny is largely removed. Peach mango seeds averaged 2⅓ seedlings per seed, and by the uniformity of the fruiting trees were considered almost completely apogamic. A comparable situation is believed to exist in the Saber mango.

Recent developments in citrus coloring, J. R. Winston and J. M. Lutz (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 45–48*).—A discussion of the present status of the subject.

An attempt to recover declined lemon trees by use of inarching, F. F. Halma (*Calif. Citrogr., 17 (1932), No. 9, pp. 349, 365–367, figs. 5*).—Of 11 different citrus species or forms used in 1926 for inarching Eureka lemons originally on sour orange roots, the Brazilian sour orange and the rough lemon were the most successful with respect to their own survival. At the end of 6 years the results as concerned the lemon trees were not promising. In general those that were vigorous in 1926 remained so and those that were weak remained weak, irrespective of the inarching treatment, and led to the suggestion that inarching of declining lemon trees has probably little merit. Progeny tests of scions from declining and vigorous trees indicated that the parental variety is an important factor in the decline of lemons.

Experiments with fertilizers on coconut palms and variation in palm productivity [trans. title], T. B. McClelland (*Porto Rico Sta. Bul. 34 (1930), Spanish ed., pp. 24, pl. 1, figs. 15*).—This is a Spanish edition of the previously noted publication (E. S. R., 65, p. 741).

Influence of smoke and ethylene on the fruiting of the pineapple (Ananas sativus Shult), A. G. Rodriguez (*Jour. Dept. Agr. Puerto Rico, 16 (1932), No. 1, pp. 5–18, pls. 2*).—In large-scale field experiments in Puerto Rico in which pineapple plants inclosed in tents of loosely woven cotton cloth were subjected to smoke there was obtained a decided hastening in the time of flowering. No relation was observed between the quantity of the smoke and the response, suggesting a wide range in effective concentrations. The fruits obtained subsequent to smoking were of large size, while those harvested from ethylene-treated plants were undersize. Smoke treatment prior to planting had no appreciable effect, whereas slips and suckers treated with ethylene previous to planting flowered several months before the controls. Since plants outside the cloth tents were stimulated by the escaping smoke, the author concludes that

temperature is not a significant factor in stimulating blossoming but that certain constituents of the smoke probably influence metabolic activities in such a way as to force the meristematic tissues into growth.

Dichogamy in the pecan, G. W. ADRIANCE (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 435–439; abs. in Texas Sta. Circ. 61 (1931), p. 24*).—The observations recorded in this paper indicate that either lack of soil moisture or lack of sufficient heat units in spring may produce protogyny in the pecan. Conversely, favorable conditions of growth in spring tended to produce protandry. Heat unit accumulations appeared to have a direct effect on the type of dichogamy, when the soil moisture is not the limiting factor.

The shrubs and climbing vines of South Dakota, N. E. HANSEN (*South Dakota Sta. Bul. 263 (1931), pp. 135, figs. 14*).—Briefly stating the uses of various shrubs and vines, the author presents descriptive notes on a large number of species and varieties which have been tested at the station.

Garden roses, C. E. WILDON (*Michigan Sta. Spec. Bul. 222 (1932), pp. 47, figs. 20*).—A general discussion upon culture, types and varieties, etc.

Effect of storage on the vitality of delphinium seeds, L. V. BARTON (*Contrib. Boyce Thompson Inst., 4 (1932), No. 2, pp. 141–153, figs. 3*).—A constant temperature of 15° C. (59° F.) or a daily alternating temperature of 10 and 20° were found most satisfactory for germinating annual and perennial delphiniums, whether fresh or stored seed was used. In the case of stored seed, sealing in air-tight receptacles exerted a beneficial influence that increased with the length of the storage period. Low storage temperature maintained the viability of seed better than did room temperature. Perennial delphinium seeds deteriorated more rapidly under unfavorable storage conditions than did annuals. Held in a favorable environment, seed germinated satisfactorily after 62 months.

FORESTRY

[Forestry at the California Station] (*California Sta. Rpt. 1931, pp. 72–74*).—Brief reports are presented on the results of studies of termite resistance of redwood, the value of various forage plants for range reseeding, and nutrient constituents of certain native grasses.

[Forestry at the Indiana Station] (*Indiana Sta. Rpt. 1931, pp. 36–38, fig. 1*).—Results of woodlot management, grazing, and nursery studies are briefly summarized.

[Forestry at the New Hampshire Station] (*New Hampshire Sta. Bul. 262 (1932), pp. 22, 23*).—Observations were made by K. W. Woodward on the extent of rabbit injury in mixed stands of hardwoods and conifers, and the results of a study (E. S. R., 66, p. 743) by C. L. Stevens on root growth of pine are briefly summarized.

The forest arboretum (*Ohio Sta. Spec. Circ. 40 (1932), pp. 8, figs. 4*).—Data are presented on a large number of plats of forest trees, with comments on the rate of growth, general performance, most desirable combinations, etc.

Seeding habit of pitch pine, A. C. MCINTYRE (*Forest Leaves, 23 (1932), No. 7, pp. 109–111*).—In this contribution from the Pennsylvania Experiment Station the results are presented of a study of cones gathered from different parts of a single tree of *Pinus rigida*, a species which is characterized by a tendency to hold its cones intact for several years. The cones from the base of the tree were slightly larger and heavier than those higher up. The greatest number of viable seeds were found in the cones collected from the middle portion of the tree. In the individual cones the greatest number of viable seed was found in the middle portion, with the lower third producing no seed. No

correlation was found between size and weight of cones and the number of rows of scales. More seed was borne in pairs than singly.

The function of fallen leaves in the Japanese black pine forest [trans. title], M. KAWADA (*Imp. Forestry Expt. Sta., Meguro, Tokyo, Bul. 31 (1931), pp. 1-39; Eng. abs., pp. 37-39*).—Measurements made by the Imperial Forestry Experimental Station, Japan, upon the diameter growth of trees from plats in which (1) leaves were gathered each year after falling, (2) gathered every other year, (3) gathered every fifth year, and (4) no collection made showed in general that the removal of leaves from the soil had a limiting effect on growth. The differences were, however, relatively slight, with little or no difference between 5-year and no collection. No significant differences were noted in the effect of leaf residue or removal on height growth.

In plats where trees were also thinned the number of species in the ground flora was less than in the unthinned areas. Although vegetation was stimulated by thinning, there was a tendency for thinning to make the species distribution more uniform.

Premature germination of forest tree seed during natural storage in duff, I. T. HAIG (*Ecology, 13 (1932), No. 3, pp. 311, 312, fig. 1*).—*Pinus monticola* seeds stored by the Northern Rocky Mountain Forest and Range Experiment Station of the U. S. D. A. Forest Service in duff beneath a dense shade of an overmature mixed stand of various conifers were found to lose about one-third of their number during the first 2 years by premature germination and death of the resulting seedlings. About 1 per cent germinated in the first year and the balance in the second.

Inaccuracy of seedling analysis in the field, H. F. MOREY (*Jour. Forestry, 30 (1932), No. 4, pp. 503, 504*).—Comparing field observations with records taken with the aid of a traversing stage microscope, the Allegheny Forest Experiment Station found rather wide discrepancies between field and laboratory records in both hemlock and white pine. In hardwoods age determination was even more difficult, but was rendered possible by treating the wood with various chemicals and using mechanical means that intensified the growth rings.

A simple method of constructing tree volume tables, D. B. DEMERITT and A. C. McINTYRE (*Jour. Agr. Research [U. S.], 44 (1932), No. 6, pp. 529-539, figs. 4*).—Stating that the technic employed in the study departs from previous practices in the preparation of alinement charts for volume table construction by the fact that base charts were not utilized, the authors present data based on average values from a sample of 209 red oak trees secured by the Pennsylvania Experiment Station in five logging operations. In the new technic, graduating curves for diameter at breast height and height are plotted on log.-log. cross-section paper, and these two independent variables are then correlated with the dependent variable, volume, to produce the finished chart. Except in the case of meager data, no axis regraduation is necessary, since the initial graduations conform strictly to the variations in form factor of the trees measured.

Managing the farm woods for profit, L. E. SAWYER (*Illinois Sta. Circ. 392 (1932), pp. 16, figs. 8*).—A general discussion, embodying the necessity of protection from fire and grazing animals and the use of improved methods of selective cutting and utilization.

Timber growing and logging practice in the coast redwood region of California, S. B. SHOW and R. Y. STUART (*U. S. Dept. Agr., Tech. Bul. 283 (1932), pp. 22, pls. 4*).—Information is presented on the status of timber growing in the redwood region, characteristics of the region and the forests, composition of the forests, yield capacity of redwood lands, facts concerning natural

reproduction, effects of past and current treatment of forest land, and measures, such as planting, preservation of natural reproduction, control of fires, selective logging, continuous cutting practices, etc., necessary to produce full timber crops.

Experiments in naval stores practice, L. Wyman (*U. S. Dept. Agr., Tech. Bul. 298 (1932), pp. 60, figs. 23*).—Experiments carried on at the Southern Forest Experiment Station, Starke, Fla., in second growth stands of slash and longleaf pines indicated the value of low chipping with respect to the duration of flow, reduction in injury to tree, and yield. Over a 5-year period shallow streaks yielded as well as deep streaks and maintained a better sustained production.

Concerning width of faces, those one-third and three-eighths of the circumference yielded more than those one-fourth width, but the last had an advantage in that three sets of faces could be cut in succession without interruption, whereas some rest was needed with the wider faces. Comparing front faces and back faces on slash pine, the indications were that back faces would underyield front faces but slightly if at all.

Trees in open stands were more productive than those densely situated. Trees less than 9 in. in diameter were generally unprofitable for chipping. Chipping reduced the rate of diameter growth.

The experiments point out the fact that trees may be chipped much longer than is now practiced commercially provided low streaks, shallow streaks, and narrow faces are used and that good sized, uncrowded trees are chipped. The yields from an ideal stand of trees are estimated, and the plan for operating such a forest is discussed. Appended is a comparison of tree groups used in the study and a glossary of forestry and naval stores terms.

DISEASES OF PLANTS

Plant pathology (*California Sta. Rpt. 1931, pp. 42, 44, 45–50, 54, 56, 85–87, 88, 101*).—Progress reports are given of investigations on certain diseases of citrus, walnut, avocado, date and other palms, alfalfa, and potatoes; nematodes in citrus groves; oat smut; inheritance of resistance to bunt (*Tilletia tritici*); cytological studies of cereal rusts; and control of diseases of stone fruits, pears, figs, and beans.

[Investigations of plant diseases] (*Connecticut State Sta. Bul. 337 (1932), pp. 457–462, 469, 470, figs. 2*).—Brief accounts are given of station work and other observations on chestnut blight, control of late blight of potato and club root of crucifers, plant diseases not previously reported in the State, a new fungus on willow, an elm tree destroying fungus, and on the need for reeradication work in connection with blister rust control.

Plant pathology (*Florida Sta. Rpt. 1931, pp. 105–123*).—Summary accounts are given of progress on investigations carried on during the year. Among the projects for which data are reported are gumming of citrus, by A. S. Rhoads; melanose and stem-end rot of citrus, by G. D. Ruehle and W. A. Kuntz; citrus canker, by K. W. Loucks; citrus scab and its control, by Ruehle; downy mildew of cucurbits, nailhead spot of tomatoes, and the investigation and control of a fungus disease of tomato caused by *Stemphylium* sp., by G. F. Weber; investigation and control of Fusarium wilt and other diseases of watermelons, by M. N. Walker; investigations relative to certain diseases of strawberries of importance in Florida, and an investigation upon the French bud, crimps, or brier bud disease of strawberries, by A. N. Brooks; investigations of diseases of white potatoes, and of brown rot of potatoes and related plants caused by *Bacterium solanacearum*, by C. M. Tucker; studies of the

so-called rust of *Asparagus plumosus*, and of diseases of ferns and ornamental plants, by W. B. Shippy; investigation and control of a disease of corn caused by *Physoderma zeae-maydis*, investigations of seedling, stalk, and ear rot diseases of corn caused by *Diplodia* spp., and investigations of seedling, stalk, and ear rot diseases of corn caused by *Fusarium* spp., by A. H. Eddins.

Studies relative to plant pathology problems in the Everglades, H. H. WEDGWORTH (*Florida Sta. Rpt. 1931, pp. 156–159*).—Notes are given on powdery mildew of beans, bacterial leaf spot and early blight of celery, early and late blight of potatoes, leaf blight of carrots, leaf spot of peanuts, potato scab, source of seed trials with potatoes, and the so-called yellows disease of beans.

[Report of the department of botany] (*Indiana Sta. Rpt. 1931, pp. 17–23, figs. 3*).—This report summarizes the progress made on investigations on tomato diseases, corn diseases, cereal leaf rusts, cereal scab, potato virus diseases, pathogenicity of three red cedar rusts that occur on apple, hosts and cultural characteristics of the apple sooty blotch fungus, anthracnose of cereals, powdery mildew of red clover, and effect of nutrition on the reaction of cereals to leaf rust.

[Report of the division of botany] (*New Hampshire Sta. Bul. 262 (1932), pp. 13–15*).—Progress reports are given on studies of the control of apple scab, by O. Butler and S. Dunn; bitter pit, leaf roll and maturity, and Burgundy mixtures, by Butler; oil sprays, by L. S. Groves; and dye adsorption by plants, by Dunn.

Report of the department of plant pathology, W. H. MARTIN (*New Jersey Stas. Rpt. 1931, pp. 307–316*).—Notes are given on the prevalence of plant diseases in the State in 1930, the data being arranged alphabetically according to host plants.

Plant pathology (*New Jersey Stas. Rpt. 1931, pp. 47–52*).—Brief summaries are given of the results of investigations on some diseases of potatoes, vegetables, fruits, and ornamentals, and their control.

Plant pathology (*Rothamsted Expt. Sta., Harpenden, Rpt. 1929, pp. 43, 44*).—"Strains of *Botrytis cinerea*, apparently identical in structure and cultural reactions, differed markedly in pathogenic properties, and conversely, strains different in structure and cultural reactions had similar pathogenic properties. For example, one strain is parasitic on Nicandra, oats, sweet pea, and harmless to sugar beet, tobacco, and broad beans, while another, indistinguishable in appearance and culture relations, is harmless to Nicandra and oats, but parasitic on sweet pea and sugar beet. It is harmless also to tobacco and broad beans. Much work is needed to clear up the difficulties of this complex subject.

"The biological relationships of these strains are being studied in view of the fact that two or more of them frequently grow intermingled on a host plant. Certain things happen when the hyphae meet, the phenomena differing with the different strains. Numerous sclerotia of particular strains have been grafted onto sclerotia of other strains, and in a percentage of cases organic union has apparently been effected. The sclerotia have then been germinated in the attempt to derive from the line of junction conidiophores and single spores containing both parental strains. Up to the present all conidia have given rise to either one or the other parental type."

For the potato wart organism, new hosts were discovered, some of which are named. In some hosts the fungus showed little evidence of its presence in the tissues.

The bacterial black arm angular leaf spot disease of cotton has been closely studied. The organism, *Bacterium malvacearum*, is capable of wide variations

in shape, size, and methods of reproduction. In a cytological study evidence was found of the presence of nuclei which undergo a division somewhat simultaneously with the division of the cell body; also they divide during the formation of the coccal forms, one-half of the structure passing into the newly formed body.

The study of the relation of the organism to the plant was continued in special chambers permitting the cotton plants to grow under controlled conditions. Primary infection occurred from 17 to 35° C., but chiefly from 24 to 25°. No infection occurred in seed from the Sudan after external sterilization, though some occurred with untreated seed, more with seed soaked in a suspension of the organism, and still more (up to 100 per cent) when the organism had been introduced within the seed coat. Neither soil temperature nor amount of primary infection influenced the incidence of secondary infection after spraying a suspension of the organism onto the plant.

Mycology (*Rothamsted Expt. Sta., Harpenden, Rpt. 1930, pp. 57–59*).—W. B. Brierley, investigating *Botrytis cinerea*, has already found over 200 races, some appearing saprophytic, some parasitic on plants over a limited range and others parasitic over a wide host range. Even this parasitism may be and usually is dependent upon conditions of host and of environment; a race attacking virulently in nature sometimes failing to attack under experimental conditions.

M. D. Glynne has developed a sensitive and rapid test as to immunity or susceptibility to wart disease, though the standards corresponding to these terms are not yet fully determined.

It was found by L. M. Kramer that dressing with phosphate reduced, and that nitrogenous fertilizer increased, the liability of potatoes to *Corticium solani*.

R. H. Stoughton continued investigation of the cotton angular leaf spot disease, *Bacterium malvacearum*. The organism may be carried in the fuzz or on but rarely within the seed coat. Thorough exterior seed disinfection almost eliminates seedling disease. Infection decreases as the soil temperature rises above 30° C. (86° F.), though infection may still occur at 40°. The plants may outgrow the disease, but they may again become infected, and the progress of the disease is then not affected by soil but by air temperature, reaching the maximum between 30 and 35°.

Virus disease study, headed by J. H. Smith, aided by J. Caldwell, M. A. Hamilton, and F. M. L. Sheffield, was previously carried on with Aucuba mosaic of tomato plants. The difference between summer and winter forms and rates of development and symptoms has been traced to the difference in length of the illumination periods. Caldwell has shown that the virus can not travel across dead tissue nor enter the living cells of the plant from the xylem unless some rupture has occurred. Where a leaf is inoculated the virus travels to the stem and then moves up and down at approximately the same rate. Sheffield studied the mode of formation of the intracellular inclusions found in cells of the diseased plants. Small particles carried in the streaming protoplasm coalesce to form larger masses and ultimately unite to form a spherical mass which becomes vacuolate and takes on an amoeboid appearance which caused them at first to be regarded as parasitic organisms. Hamilton has devised improved methods for the study of transference by insects of virus diseases.

Observations on fungous diseases in crops on experimental plots at Rothamsted and Woburn, May–September, 1930, M. D. GLYNNE (*Rothamsted Expt. Sta., Harpenden, Rpt. 1930, pp. 62, 63*).—Brief information is given regarding wheat take-all or white-heads (*Ophiobolus graminis*), leaf spot (*Sep-*

toria tritici), and yellow rust (*Puccinia glumarum*); barley leaf stripe (*Helminthosporium gramineum*), net blotch (*Pyrenophora teres* (*H. teres*)), leaf blotch (*Rhynchosporium secalis*), yellow rust (*Puccinia glumarum*), and mildew (*Erysiphe graminis*); rye leaf blotch (*R. secalis*); and grass plats choke (*Epichloe typhina*).

Diseases of plants.—General part, V. RIVERA (*Malattie della Piante. Parte Generale. Rome: G. Bardi, 1930, pp. 108, figs. 8*).—Systematic treatment is accorded in the separate chapters as to the influence of meteorological conditions and of soil upon the development of diseases (infections) attacking the plant, to heredity of resistance and experimental genetics, and to internal factors of resistance.

Action of metabolic products of microorganisms on host plants [trans. title], C. CAPPELLETTI (*Ann. Bot.* [*Rome*], *19* (*1931*), *No. 1, pp. 1–62, pls. 3, figs. 2*).—Having isolated a fungus (*Rhizoctonia* sp.), presumably symbiotic, from roots of *Allium roseum*, the author subjected healthy plants of the same species, also of *A. ursinum* and of *Pisum sativum*, to an extract of the fungus or to a broth culture. The effects on the physiology and morphology of the plants is detailed, with comment on toxic action observed.

Vacuolar changes in diseased cells, J. DUFRENOY (*Phytopathology, 19* (*1929*), *No. 1, p. 95*).—By suitable staining, clusters of small vacuoles surrounding the hyphae of rust fungi may be observed. Clusters of such vacuoles surrounded by deeply stained cytoplasm are also conspicuous in cells of discolored areas of mosaic-infected plants. The breaking down of the larger normal vacuoles is believed to be a local proteolytic process.

Increase of resistance to disease with altitude [trans. title], J. COSTANTIN (*Jour. Agr. Prat., n. ser., 54* (*1930*), *No. 39, pp. 249, 250*).—Evidence cited or quoted bears upon the question of increase (or the reverse) of resistance to plant disease with altitude.

Studies on the influence of environment on infection by certain bacterial plant parasites, A. J. RIKER (*Phytopathology, 19* (*1929*), *No. 1, p. 96*).—Experiments with *Bacterium lachrymans*, *B. pisi*, and *B. tabacum* showed that moisture, temperature, and maturity of inoculated leaves influence infection and size of lesions.

Further agglutination tests with phytopathogenic bacteria, G. K. K. LINK, A. E. EDGECOMBE, and J. G. GODKIN (*Phytopathology, 19* (*1929*), *No. 1, p. 99*).—Following the experimental procedure used in previous work (E. S. R., 60, p. 545), the authors report studies which indicate various serological relationships of a number of bacteria which cause diseases of economic plants. All tests for normal agglutinins were negative.

Studies on the differentiation of the crowngall type of bacteria from nonpathogenic bacteria of the radiobacter group, W. H. WRIGHT, A. J. RIKER, and H. E. SAGEN (*Phytopathology, 19* (*1929*), *No. 1, p. 98*).—Comparisons of pure cultures of *Bacterium tumefaciens* and *B. radiobacter* showed striking similarities. They are very similar in characteristics where the crown gall and hairy root organisms are quite different.

Studies on the bacteriological differentiation of the crowngall and hairyroot types of bacteria, W. H. WRIGHT, A. J. RIKER, H. E. SAGEN, and W. M. BANFIELD (*Phytopathology, 19* (*1929*), *No. 1, pp. 97, 98*).—A comparison of the crown gall (*Bacterium tumefaciens*) type of organism with the type which causes hairy root showed that they differed in a number of morphological and physiological characters, suggesting differentiation of a specific rank.

Some researches on Pseudomonas tumefaciens, M. K. PATEL (*Phytopathology, 19* (*1929*), *No. 1, pp. 98, 99*).—Immune serum produced against a raspberry

strain of *P. tumefaciens* by injections of a rabbit agglutinated the homologue but not the crown gall organisms from a number of other host species. The raspberry strain inoculated into *Salix babylonica* and reisolated after more than three months did not differ in agglutination tests. Agglutinable and inagglutinable pathogenic strains of *P. tumefaciens* were not affected by a passage through tomato plants. The crown gall organism is reported to survive passage through the blood stream of rabbits and the digestive tract of mice and guinea pigs.

Potency and specificity of a lytic principle (bacteriophage) obtained from Pseudomonas tumefaciens, J. H. MUNCIE and M. K. PATEL (*Phytopathology, 19 (1929), No. 1, p. 98*).—A lytic principle was obtained from cultures of *P. tumefaciens* that when tested against 20 strains of the crown gall organism isolated from various hosts was specific only against the strain of the crown gall organism from which it was developed.

Plant chlorosis [trans. title], P. MAZÉ and P. EVENS (*Jour. Agr. Prat., n. ser., 51 (1929), No. 9, pp. 172, 173*).—Regarding certain (always the same and usually depressed) areas in certain plants (particularly pea, bean, carrot, cabbage, leek, onion, artichoke, and potato) which frequently suffer from chlorosis, the authors state that the trouble may be combated or prevented by spraying the leaves with an iron sulfate solution, 1 g to 10 l of water. This restores the green color in two or three days and brings about vigorous growth.

Ceratostomella cana E. Münch as a variety of C. piceae E. Münch [trans. title], F. ZACH (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 39 (1929), No. 1, pp. 29–35, figs. 11*).—Referring to the statements by Münch (E. S. R., 20, p. 1046) regarding principally the fungus forms called by Münch *C. piceae* and *C. cana* and their association with forms of Graphium, the present author adds his own observations and his conclusions that *C. cana* is not itself an independent species, but that it is a variety of *C. piceae*, which he accordingly names *C. piceae cana*.

Study of Ceratostomella pini, C. piceae, and C. cana [trans. title], E. MÜNCH (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 40 (1930), No. 11, pp. 513–516*).—A continuation of studies previously indicated (E. S. R., 59, p. 548), including now *C. piceae* and *C. cana*, is detailed. The author is unable to agree with the conclusions of Zach, above indicated.

Further studies on Exoascaceae, A. J. MIX (*Phytopathology, 19 (1929), No. 1, p. 90*).—The author reports having grown in cultures *Exoascus deformans*, *E. mirabilis*, and *E. mirabilis tortilis* from *Prunus angustifolia*; *E. pruni* from *P. domestica*; *Exoascus* sp. from *Alnus incana* and *A. rugosa*; *E. communis* from *P. americana*; and *Taphrina coerulescens* from *Quercus rubra*.

Plant rusts of Peru [trans. title], J. C. ARTHUR (*Estac. Expt. Agr. Soc. Nac. Agr., Lima, Bol. 2 (1929), pp. 14*).—The list includes 83 species of rusts. There are besides a short list of related publications, an index of Uredinales, and a host index.

Physico-chemical study of viruses (*Indiana Sta. Rpt. 1931, pp. 52, 53*).—A description is given of methods employed for the isolation of the virus of mosaic-infected plants.

Toxic and tolerable dosage of Upsulun Universal for different agricultural seeds [trans. title], A. NIETHAMMER (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 40 (1930), No. 11, pp. 517–520*).—Both toxic and tolerated dosages are tabulated for *Triticum sativum*, *Secale cereale*, *Lupinus albus*, *Pisum sativum*, *Solanum lycopersicum*, *Brassica capitata*, *Cucumis sativus*, *Allium cepa*, *Cannabis sativa*, *Linum usitatissimum*, and *Sinapis alba*, with a brief discussion in each case.

Toxicity of mercury and copper compounds in relation to their use for seed treatment and spraying, E. E. CLAYTON (*Phytopathology, 19 (1929), No. 1, p. 86*).—The author points out the desirability of more fundamental information regarding the specific action of copper and mercury as plant poisons as a basis for the recommendation of control measures. Various species of plants were found to react quite differently, and in some instances seeds were not injured but the plants were quite sensitive to treatments with the same fungicides.

The influence of the form and proportion of lime and copper sulphate on the suspension of Bordeaux mixture, F. J. SCHNEIDERHAN (*Phytopathology, 19 (1929), No. 1, p. 88*).—About 1,000 tests of Bordeaux mixture made by various formulas are said to have shown that chemical hydrated lime used in combination with finely granulated copper sulfate gave a mixture of excellent suspension properties. A 2-3.5-50 mixture gave the best suspension, but others were nearly as good, and all were better than Bordeaux mixture made from stock solutions of slacked stone lime and copper sulfate.

Dusts composed of lime-sulphur and sulphur, H. C. YOUNG (*Phytopathology, 19 (1929), No. 1, pp. 88, 89*).—An 85–15 sulfur dry lime-sulfur dust is reported to have given excellent control of apple scab in a season exceptionally favorable for the development of scab.

Chemistry of the toxic factor of sulphur, R. C. WILLIAMS and H. C. YOUNG (*Phytopathology, 19 (1929), No. 1, p. 89*).—Studies of various forms of sulfur showed that their toxicity to *Venturia inaequalis* depended upon their reaction, oxidation, temperature, and moisture. Of the acids known to be associated with sulfur only the polythionic acids were toxic to the fungus. Sulfurs freed from such acids were nontoxic. Several oxidized sulfur dusts were found effective in the control of apple scab. The toxic factor was destroyed by alkalies and strong acids.

Adhesiveness of sulphur mixtures, H. C. YOUNG and L. E. TISDALE (*Phytopathology, 19 (1929), No. 1, p. 89*).—Of a number of stickers and fluffers tested, none increased the adhesiveness of ground roll sulfur. Sulfur remaining on the leaves after heavy rains was found to be in a very finely ground state. Less sulfur remained on leaves and slides when applied as a heavy coating than when smaller quantities were used.

Acetic acid and pyroligneous acid in comparison with formaldehyde as soil disinfectants, W. L. DORAN (*Jour. Agr. Research [U. S.], 44 (1932), No. 7, pp. 571–578, fig. 1*).—In a previous publication the author reported on the efficiency of dilute acetic acid as a soil disinfectant (E. S. R., 59, p. 239). Additional evidence is presented, from the Massachusetts Experiment Station, which verifies previous conclusions relating to the value of acetic acid for soil treatments. Further comparisons were made between acetic and pyroligneous acids and formaldehyde as soil disinfectants.

Acetic acid was found to be as safe and as effective a soil disinfectant as formaldehyde, and the cost of soil disinfection with acetic acid was less than with formaldehyde. Damping-off of seedlings of the beet, cucumber, and lettuce was prevented without injury to seed germination and with benefit to the growth of plants by soil treatment with 1.19 per cent acetic acid applied at the rate of from 2 to 2.5 qt. per square foot of soil.

The best results with acetic acid against soil-borne fungi in tobacco seed beds were secured when the soil was treated in the fall rather than in the spring. With acetic acid, as with formaldehyde, it was found necessary that there should be some interval of time, usually 10 days, between soil treatment and seeding, otherwise seed germination was injured. Damping-off of seedlings

of tobacco was prevented with no injury to germination by vinegar 1 part in 2.5 parts of water applied to the soil at the rate of 2 qt. per square foot 10 days before seeding.

Seedlings of red or Norway pine were protected against damping-off, and germination was not injured, by acetic acid 0.8 per cent applied to soil at the rate of 0.75 qt. per square foot at the time of seeding.

Pyroligneous acid 3:100 to 4:100 applied to soil at the rate of 2 qt. per square foot protected seedlings from damping-off and did not injure the germination of the seeds of the beet, cucumber, and lettuce even when applied to the soil as late as 1 day before seeding. The treatment also resulted in an increase in the dry weight of the plants. Per unit area of soil treated, the cost with pyroligneous acid was less than with either formaldehyde or acetic acid. The author considers pyroligneous acid as effective a soil disinfectant as formaldehyde or acetic acid, and safer and cheaper than either.

Ethyl mercury chloride as a seed grain disinfectant, W. H. Tisdale and W. N. Cannon (*Phytopathology, 19 (1929), No. 1, p. 80*).—It is claimed that dusts containing from 0.5 to 4 per cent ethyl-mercury chloride applied to infested seeds controlled a number of seed-borne diseases, but in some cases the seeds were injured. Satisfactory results were obtained with 1.5 per cent dust in the control of bunt of wheat, covered smut and stripe of barley, loose smut of barley, smut of oats, and covered kernel smut of sorghum.

Experiments with liquid and dust seed disinfectants for controlling covered smut of barley and stinking smut of wheat, 1926–1928, R. W. Leukel (*Phytopathology, 19 (1929), No. 1, p. 81*).—The results are given of tests of a number of proprietary fungicidal dusts in comparison with copper carbonate for the control of covered smut of barley and stinking smut of wheat. Very dry soil conditions during germination and emergence were found to reduce the fungicidal action of the dusts.

Cereal smuts and their control (*[Gt. Brit.] Min. Agr. and Fisheries Bul. 24 (1930), pp. V+16, figs. 7*).—Cereal smuts occasion heavy losses annually in Great Britain. Bunt is ascribed to two different fungi, *Tilletia caries* and *T. foetens*, the former causing nearly all of the loss. A description is given of the disease and an account of its mode of infection, with information regarding its prevention by use of treatments with copper sulfate, formaldehyde, and powders. Briefer accounts are given also of wheat loose smut, and of the loose and the covered smuts of barley and of oats.

Relation of the removal of smut balls to the control of stinking smut in winter wheat, R. S. Kirby (*Phytopathology, 19 (1929), No. 1, p. 79*).—A report is given of studies of the efficiency of cleaning machinery in removing smut balls from winter wheat.

The influence of environment during maturation upon predisposition to seedling blight in wheat and corn strains, J. G. Dickson, P. E. Hoppe, J. R. Holbert, and G. Janssen (*Phytopathology, 19 (1929), No. 1, p. 79*).—Studies of the relation between the environment during maturation and the subsequent response of seedlings to infection showed that resistant strains of spring wheat became susceptible to infection and were poor producers when matured in Illinois, whereas the same strains matured at the Wisconsin Experiment Station remained resistant. Similar results were obtained with late-maturing inbred lines of corn grown at Madison, Wis., the highly resistant strains being quite susceptible to seedling blight.

The relation of weather to the development of stem rust in the Mississippi Valley, E. B. Lambert (*Phytopathology, 19 (1929), No. 1, pp. 1–71, figs. 11*).—An attempt is made to analyze the relation of weather to the development of stem rust in the Mississippi Valley.

Weather was found to affect the development of all phases of the life cycle of the stem rust organism. Teliospores were found to lose their viability if kept at high temperatures for several months. This is thought to explain the absence of rust on barberries in the Southern States. Time seemed to be the most important factor in the rest period of the teliospores, freezing, thawing, wetting, and drying being without measurable effect. Teliospores were found to be viable in the vicinity of St. Paul, Minn., several weeks before barberry leaves appeared in the spring. After they were matured different lots of spore material germinated at various times, thus insuring the germination of teliospores in several rainy periods. Teliospore germination occurred over a wide range of H-ion concentrations, and the spores were not affected by light. Usually under natural conditions the spores lost their viability within a few months after maturity.

The optimum temperature for infection of barberry by *Puccinia graminis secalis* was from 17 to 18° C. Practically no germination occurred at 28° or above. Penetration of barberry leaves was favored by low light intensity, while aecial infection appeared to be favored by intense light.

Overwintering of urediniospores seemed to be limited to regions and seasons favorable for the development of the uredostage at frequent intervals throughout the winter. Alternate freezing and thawing seemed to be the limiting factor. In southern Texas summer weather conditions were found more important than winter conditions in limiting the uredinial stage of the rust. The predominance of stem rust in oats over that on wheat in northern Texas was thought to be associated with the persistence of volunteer oats.

Southerly winds sweep the Mississippi Valley when stem rust is plentiful in the South with sufficient velocity to carry the spores from Texas to the spring wheat area in less than three days. A correlation was found between growing seasons and rust epidemics in the spring wheat area, but total rainfall or number of rainy days was not associated with epidemics. Epidemics of rust occurred in the Red River Valley in the almost total absence of rainfall. Heavy dews in this region are considered to account for these epidemics.

Common diseases of cereals in Michigan, J. H. Muncie (*Michigan Sta. Circ. 142 (1932), pp. 54, figs. 25*).—Popular descriptions are given of some of the common diseases of wheat, oats, barley, rye, and corn, with suggestions for their control so far as definite procedures are known.

Cereal foot rot [trans. title], L. Guyot (*Jour. Agr. Prat., n. ser., 51 (1929), No. 22, pp. 436–438*).—Foot rot is said to be one of the most important of the cryptogamic diseases attacking cereals, especially wheat, in this region. Observations and opinions are indicated as to predisposing causes and hopeful means for lessening the losses resulting from the activity of the causal or related fungi, which include *Ophiobolus graminis*, *Leptosphaeria herpotrichoides*, and *Fusarium culmorum*.

Physiological studies of Bacterium translucens and Bacterium translucens var. undulosum, J. Godkin (*Phytopathology, 19 (1929), No. 1, p. 99*).—Attention is called to some of the differences when grown on agar of *B. translucens*, which attacks barley, and *B. translucens undulosum*, a parasite of wheat, barley, and rye.

Susceptibility of barley varieties to fusarial head blight in Minnesota, J. J. Christensen, H. A. Rodenhiser, and C. Tu (*Phytopathology, 19 (1929), No. 1, p. 80*).—A test of 132 varieties and selections of barleys was made in which the plants were subjected to an artificial epidemic produced by several species of Fusarium. Some varieties were found to be very susceptible, some were highly resistant, and others were intermediate. Improved Manchuria,

Minnesota 184; Svansota, Minnesota 440; and Peatland, Minnesota 452, were among the most resistant. No correlation was found between varietal resistance to scab and to spot blotch.

Experiments on stripe disease of barley and its control, R. W. Leukel, J. G. Dickson, and A. G. Johnson (*Phytopathology, 19* (*1929*), *No. 1, p. 81*).—A preliminary report is given of tests of more than 50 dust disinfectants of American and foreign manufacture recommended for the control of stripe disease of barley. The age of the seed was found to show no relation to the effectiveness of the fungicides. The dusts did not greatly increase either germination or stand. Yields were increased by the more effective treatments. Relatively dry soil during the period of emergence favored stripe development as compared with wet soil. Stripe developed most abundantly at a temperature of 15° C. or below, and none occurred at 28°, but changing the soil temperature after the appearance of the first leaf stage from 12 to 28°, or vice versa, did not affect the percentage of stripe.

Leaf stripe or yellow leaf of oats, D. G. O'Brien and E. G. Prentice (*Scot. Jour. Agr., 13* (*1930*), *No. 3, pp. 272–284, pls. 4, figs. 5*).—Recent observations have shown that oat leaf stripe (*Helminthosporium avenae sativae*) is general throughout Scotland, but much more prevalent in the southwest counties, where the percentage of diseased established plants runs from 10 to 41, with an average of about 25 per cent. In Scotland leaf stripe causes more loss than all other oat diseases together. This disease situation is discussed as to the symptoms, susceptibility, time of sowing, locality, character of the fungus, and its control.

Tests of seed treatment with Ayrshire-grown oat seed of the varieties Victory and Record are outlined with tabulation of results, which for the years 1927–1930 are favorable. The cost of treatment is reasonably low, and the advantage is considerable.

Susceptibility and resistance of Berberis and related genera to Puccinia graminis, M. N. Levine and R. U. Cotter (*U. S. Dept. Agr., Tech. Bul. 300* (*1932*), *pp. 27, figs. 8*).—The results of artificial inoculations in the greenhouse, observations of natural infections in the field and examination of the material, and the studies of the published reports of other investigators have shown that approximately 90 per cent of the species of the genus Berberis are susceptible in varying degrees to one or more of the parasitic races of *P. graminis*. The variation in susceptibility is said to have depended on the constancy of biotic and climatic factors, such as physiologic specialization of the rust pathogene, genetic nature and age of the host, prevailing temperature, humidity, light intensity, etc.

Only a dozen species and varieties of Berberis appear to be immune from stem rust, and it is thought that further study might possibly prove some of these to be susceptible. There appeared to be very little doubt, however, that *B. thunbergii* and *B. repens* were actually immune.

In general, the species resembling the common barberry were found to be susceptible to stem rust, while those resembling the Japanese barberry were resistant or immune. There were some notable exceptions to this. *B. repens*, the small trailing Mahonia, appeared immune, while the tall Mahonia, *B. aquifolium*, was susceptible, as shown by artificial inoculations and direct observations.

A cytological study of Heterothallism in Puccinia triticina, R. F. Allen (*Jour. Agr. Research* [*U. S.*], *44* (*1932*), *No. 10, pp. 733–754, pls. 11*).—*P. triticina*, the leaf rust of wheat, is said to have its gametophyte generation on species of Thalictrum. The sporidium, formed by the germinating teliospore

in the spring, is a haploid spore, and when it falls upon a Thalictrum leaf it germinates, enters through the outer epidermal wall, and forms a 4-cell to 6-cell primary hypha in the epidermal cell, which in turn gives rise to haploid intercellular mycelium. After about six or seven days of vegetative growth, reproductive activities of the fungus set in.

P. triticina is considered heterothallic, and a comparative study of infections of the same age showed that some have many spermogonia and few receptive hyphae, others have comparatively few spermogonia and more receptive hyphae, and a few have no spermogonia and abundant receptive hyphae.

Preliminary report on a bacterial disease of corn, A. G. Johnson, L. Cash, and W. A. Gardner (*Phytopathology, 19 (1929), No. 1, pp. 81, 82*).—The occurrence of a bacterial disease of corn that differs from that described by Rosen (E. S. R., 58, p. 650) is reported from Alabama and Virginia.

Studies in the physiology and cytology of Ustilago zeae and Sorosporium reilianum, W. F. Hanna (*Phytopathology, 19 (1929), No. 1, p. 91*).—The sporidia of *U. zeae* are said to be haploid, while those of *S. reilianum* are heterothallic. Corn plants inoculated with monosporidial cultures never produce galls, while mixtures of certain pairs of monosporidial cultures do produce galls. Sporidia of four sexual groups may be produced from a single chlamydospore of *S. reilianum*. Young corn plants develop galls when inoculated with a combination of cultures of opposite sex. Mixed monosporidial cultures of *U. zeae* and *S. reilianum* did not produce galls on young corn plants.

Pathogenicity of multisporidial and monosporidial cultures of Ustilago zeae (Beckm.) Ung., A. H. Eddins (*Phytopathology, 19 (1929), No. 1, p. 91*).—Multisporidial cultures from a single smut ball of *U. zeae* are reported to have differed in their ability to inoculate seedlings of corn. Five monosporidial cultures also failed when used alone, but when used in certain mixtures chlamydospores were produced.

Inheritance of resistance to seedling blight of corn caused by Gibberella saubinetii, P. E. Hoppe (*Phytopathology, 19 (1929), No. 1, pp. 79, 80*).—F_1 hybrids resulting from a cross of a resistant and susceptible variety were as resistant as the resistant parent, and analyses of 27 F_3 families gave evidence of transgressive segregation, one family being practically immune. Other families indicated that the F_3 families had been very heterozygous.

Some vegetable diseases in 1930, W. H. Martin (*N. J. State Hort. Soc. Proc., 1930, pp. 142–146*).—These diseases as reported include cabbage yellows and seed bed diseases, sweet corn bacterial wilt and smut, pepper mosaic, and sweetpotato scurf.

Progress report on vegetable diseases, L. Ogilvie and B. O. Mulligan (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1930, pp. 127–146*).—This report, a continuation of that published the year before (E. S. R., 67, p. 405), deals briefly with progress made toward control of diseases of vegetables in the Bristol Province, with special reference to the Evesham and the Cheltenham area. The diseases dealt with include those of asparagus, dwarf (French) beans, broadbeans, sugar beets, leek, lettuce, mint, onions, parsnips, peas, potatoes, and vegetable marrow.

Comparative pathological histology of three bacterial diseases of bean, W. J. Zaumeyer (*Jour. Agr. Research [U. S.], 44 (1932), No. 8, pp. 605–632, figs. 16*).—Greenhouse investigations are reported in which bean seeds were infected with *Bacterium phaseoli*, *B. medicaginis phaseolicola*, and *B. flaccumfaciens*. From the standpoint of symptomatology it appears possible to differentiate the three diseases. Histologically, the diseases caused by *B. phaseoli* and *B. medicaginis phaseolicola* can be readily distinguished from the disease

caused by *B. flaccumfaciens*. Staining and growth characteristics also serve to differentiate the diseases caused by the different organisms.

Seed infection by Bacterium phaseoli, W. J. ZAUMEYER (*Phytopathology, 19 (1929), No. 1, p. 96*).—The author describes a method by which bean seeds are invaded by *B. phaseoli*. The bacteria enter the seed through the funiculus or through the micropyle, but they are not found in the cotyledons before germination. During germination the epidermal cells are ruptured and the cotyledons invaded, and later the developing seedling is affected.

A Fusarium disease of beans, L. L. HARTER (*Phytopathology, 19 (1929), No. 1, p. 84*).—A disease of beans observed in the Sacramento Valley, Calif., is described as due to a Fusarium apparently of the Elegans group. The plants were dwarfed and conspicuously yellow, but no wilting was observed.

A leaf deformation of beet and of spinach [trans. title], K. BÖNING (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 40 (1930), No. 7, pp. 315–323, figs. 7*).—Study of a leaf deformation of beet and of spinach observed in 1927 (E. S. R., 61, p. 45), has shown that it was carried by *Aphis rumicis*, *A. fabae*, and *Myzus persicae*. Particulars are given regarding inoculation period, primary and later symptoms, and results. Supposedly a mosaic-like virus is involved. Relations are discussed.

Brassicaceous club root [trans. title], C. GONZÁLEZ DE ANDRÉS (*Bol. Patol. Veg. y Ent. Agr. [Madrid], 4 (1929), No. 15–18, pp. 98–104, figs. 3*).—In severely infested areas the soil must be kept absolutely free for at least three years from plants capable of harboring the slime mold *Plasmodiophora brassicae*.

Acid injury of cotton roots, J. J. TAUBENHAUS and W. N. EZEKIEL (*Bot. Gaz., 92 (1931), No. 4, pp. 430–435, figs. 6; abs. in Texas Sta. Circ. 61 (1931), p. 26*).—In an experiment on the relation of cotton root rot caused by *Phymatotrichum omnivorum* to soil reaction in which various materials were added to change the soil reaction, excessive applications of sulfur caused injury to cotton roots, as was evidenced by the characteristic enlargement and cracking, followed by the death of the plants. The injured areas of the taproots were found to correspond to the location of the more acid layers of the soil (at pH 2 to 4). Less severe cases were found in the field and in experiments with a soil naturally at pH 6.1.

Anatomy of normal and acid-injured cotton roots, U. R. GORE and J. J. TAUBENHAUS (*Bot. Gaz., 92 (1931), No. 4, pp. 436–441, figs. 10; abs. in Texas Sta. Circ. 61 (1931), p. 26*).—Anatomical studies were made of acid-injured cotton roots reported above. Marked proliferations of acid-injured cotton roots were found to arise from cell division of the ray cells of the xylem and phloem, and from a stimulation of the cambium and phellogen. The original phloem may be killed and become functionless. The proliferated cells were generally thin-walled parenchyma cells varying somewhat in size and form. Tyloses were present in both cases, but did not seem to be related to acid injury.

Soil cultures for the laboratory production of sclerotia in Phymatotrichum omnivorum, B. F. DANA (*Phytopathology, 21 (1931), No. 5, pp. 551–556, figs. 2; abs. in Texas Sta. Circ. 61 (1931), pp. 20, 21*).—A method is described for culturing *P. omnivorum* in which nonsterilized soil is used as a cultural medium and newly diseased roots as inoculum. This type of culture is said to be well adapted to a study of the moisture and temperature requirements for the production of strands and sclerotia in the cotton root rot fungus under conditions comparable to those found in the field, and to test the effectiveness of chemical and fertilizer applications for cotton root rot control.

138389—32——4

Preliminary studies on the effect of flooding on Phymatotrichum root-rot, J. J. TAUBENHAUS, W. N. EZEKIEL, and J. P. LUSK (*Amer. Jour. Bot., 18 (1931), No. 2, pp. 95-101; abs. in Texas Sta. Circ. 61 (1931), p. 19*).—The authors report that root rot caused by *P. omnivorum* is uncommon in bottom lands in soils which are apparently favorable for the development of the disease. The root rot fungus was introduced into creek bottom land through the artificial inoculation of the cotton plant, and it reappeared the year following inoculation. In laboratory experiments, strands of *P. omnivorum* on naturally infected cotton roots were inactivated by submergence in saturated soil for more than three days, while in a parallel series, at the same temperature but stored in moist air, the fungus remained viable for two weeks and was still able to infect normal cotton plants.

Flooding experiments in the field, during three seasons and continued as long as 120 days, failed to produce significant changes in the survival of the root rot fungus or to eliminate roots of root rot carriers in the soil. The survival in this case is considered due possibly to a lack of penetration of the water and the possible presence of sclerotia which are able to survive long periods of immersion.

Report of the fourth annual cotton-root-rot conference, W. N. EZEKIEL, D. C. NEAL, P. R. DAWSON, and E. B. REYNOLDS (*Phytopathology, 21 (1931), No. 10, pp. 957-964; abs. in Texas Sta. Circ. 61 (1931), p. 26*).—Summary reports are given of papers presented at this conference. The reports are grouped according to the life history and related studies of the fungus *Phymatotrichum omnivorum*, and studies relating to its control.

"Rhizoctonia solani" (Kühn) on cotton in Trinidad, 1929–30, J. WEST (*Trop. Agr. [Trinidad], 7 (1930), No. 8, p. 223*).—In 1929, a heavy crop of Bengal bean (*Stizolobium deeringianum*) was followed up with Sea Island cotton, which was replanted with the Sea Island and the Million Dollar variety, both soaked and unsoaked seed being used. Although the seed of both varieties had tested above 90 per cent as to viability, heavy mortality occurred in each case. This was ascribed to the presence of *R. solani*. Factors supposedly favoring the infestation included the presence of decomposing trash in the ridges, too deep covering of the seed in puddled soil, heavy rains just after planting, and binding of the soil when drying out. The infections were of three main types, the germinating seeds being killed before emergence, the seedlings being attacked at the ground level and then mostly dying, or plants even three or four weeks old being attacked and killed.

An experiment was made to test the pathogenicity of *R. solani* on 27 farm plants in all, the results from which are tabulated.

***A disease of young cotton plants caused by* Sclerotium rolfsii,** W. N. EZEKIEL and J. J. TAUBENHAUS (*Phytopathology, 21 (1931), No. 12, pp. 1191–1194, fig. 1; abs. in Texas Sta. Circ. 61 (1931), p. 26*).—A stem rot of young cotton plants was found to be due to the fungus *S. rolfsii*. This was proved by artificial inoculations of seedlings grown in sterilized soil in the laboratory. Artificially inoculated mature plants in the field did not become infected. In attempts to control the disease fewer diseased plants occurred in plats which had received treatment with organic mercury compounds.

Strangulation of cotton roots, J. J. TAUBENHAUS, W. N. EZEKIEL, and H. E. REA (*Plant Physiol., 6 (1931), No. 1, pp. 161–166, figs. 2; abs. in Texas Sta. Circ. 61 (1931), pp. 18, 19*).—The authors report having received from Texas, Arkansas, and Mississippi specimens of a peculiar cotton root trouble. The affected plants usually possessed well-developed root systems, but the upper parts of the tap and lateral roots were separated from the lower parts by con-

strictions often an inch or more in length and 0.3 to 0.4 mm in thickness. No evidence of decay was present, and studies are said to have indicated that the malformation was of a nonparasitic nature. It is reported to occur only in flat, poorly-drained, heavy clay soils, which are compacted by continuous rain or irrigation, and then further hardened, in the absence of cultivation, by continued hot, dry weather. The affected plants were found to die when the constricted areas were killed, or when the moisture supply transported through the constricted areas became inadequate for the requirement of the plants.

Verticillium wilt of cotton, C. D. SHERBAKOFF (*Phytopathology, 19 (1929), No. 1, p. 94*).—It is claimed that the wilt of cotton caused by *V. alboatrum* can be distinguished from that due to *Fusarium vasinfectum* by the shedding of the leaves and young bolls before the withering of the tips and branches, and by the absence of any discoloration of the cambium. The discoloration of the fibrovascular bundles present in both wilts is more evenly distributed in the case of Verticillium wilt.

Cotton wilt studies.—IV, Effect of fertilizers on cotton wilt, V. H. YOUNG, G. JANSSEN, and J. O. WARE (*Arkansas Sta. Bul. 272 (1932), pp. 27, figs. 5*).—Field experiments are reported on the effect of fertilizers on cotton wilt in eastern Arkansas, the data being supplemented by fertilizer tests in other portions of the State.

High potash applications alone and fairly high potash applications in combination with nitrogen- and phosphorus-containing salts gave definite control of cotton wilt at points in central, eastern, and northeastern Arkansas. High nitrate applications, applications containing nitrogen and phosphorus only, and applications of cottonseed meal alone were inefficient in cotton wilt control. The control of cotton wilt through the use of potash-containing fertilizers seemed in nearly all cases to be correlated with or coincident to the control of rust, stimulation of vegetative growth, and increased yields of seed cotton.

Other work at the station (E. S. R., 66, p. 837) indicated varietal resistance to cotton wilt, and the authors conclude that on sandy alluvial soils where cotton wilt and rust are often found together in a severe form, a combination of a suitable wilt-resistant variety of cotton and the judicious use of a fertilizer containing potash will prove the best possible solution of the cotton wilt problem now available.

Breeding for resistance to cucumber mosaic disease, E. E. CLAYTON (*Phytopathology, 19 (1929), No. 1, p. 85*).—A brief account is given of attempts to produce strains of cucumbers that are resistant to mosaic. Inbreeding was resorted to, and the development of mosaic-resistant varieties similar to types now in use is believed practicable. The various lines were tested, and all were found susceptible to downy mildew, *Pseudoperonospora cubensis*. Some lines were extremely susceptible to bacterial wilt, *Bacillus tracheiphilus*, although a few lines showed moderate resistance.

Reaction of Chinese cucumbers to mosaic, R. H. PORTER (*Phytopathology, 19 (1929), No. 1, pp. 85, 86*).—Inoculation experiments have shown that the cucumber variety Chinese Long is subject to mosaic, but that the characteristic symptoms of the disease are less marked on this variety and the percentage of plants that show mottling or crinkling after inoculation is low. Susceptible American varieties were readily infected with a virus taken from diseased Chinese cucumbers.

Calcium arsenate as a fungicide, H. H. WHETZEL, S. E. A. MCCALLAN, and T. C. LOH (*Phytopathology, 19 (1929), No. 1, p. 83*).—In experiments for the control of *Alternaria panax* on ginseng, a proprietary fungicide was found to prevent infection. A laboratory study of the fungicide led the authors to

believe that the action was due to the calcium arsenate contained in the mixture.

A fruit rot of honey dew melons due to a species of Phytophthora, C. DRECHSLER (*Phytopathology, 19 (1929), No. 1, p. 85*).—The author reports the isolation of a species of Phytophthora from lesions on a honeydew melon which reproduced the disease when inoculated into healthy fruits.

A new virus disease epidemic on onions, I. E. MELHUS, C. S. REDDY, W. J. HENDERSON, and E. VESTAL (*Phytopathology, 19 (1929), No. 1, pp. 73–77, fig. 1*).—A preliminary account is given of investigations of a new onion disease that appeared in an epidemic form in Iowa in 1928. The disease was reproduced by inoculating sets with filtrate from diseased bulbs. The disease is called yellow dwarf from the characteristic symptoms produced.

The yellow dwarf of onions, I. E. MELHUS and W. J. HENDERSON (*Phytopathology, 19 (1929), No. 1, p. 86*).—This is an abstract of the above paper.

Potato canker and climate [trans. title], T. J. HINTIKKA ([*Finland*] *Valtion Maatalouskoetoiminnan Julkaisu. No. 23 (1929), pp. [2]+102, figs. 11; Ger. abs., pp. 97–101*).—The author undertakes to give, on the basis of literature found available, an account of the occurrence of potato canker, *Synchytrium endobioticum*, and the different conditions existing where it is found, in Finland, Germany, Poland, Czechoslovakia, Austria, Switzerland, France, Belgium, Netherlands, Great Britain, Northern Ireland and Irish Free State, Denmark, Norway, Sweden, and North and South America.

Within areas having an average annual rainfall of 500–600 mm or less the occurrence of potato canker is comparatively rare and moderate in amount.

Net-necrosis of Irish potato tubers, G. H. GILBERT (*Phytopathology, 19 (1929), No. 1, p. 82*).—Net-necrosis of potatoes is said to involve the sieve tubes, companion cells, and adjacent parenchyma, which together constitute the brown strands in infected tubers. The earliest indications of necrosis are the occurrence of dead and discolored protoplasmic contents of the sieve tubes and companion cells. The necrotic areas are frequently separated from the surrounding normal tissues by cork cambium. Changes in necrotic areas involve accumulations of suberin, lignin, and pectic substances. Net-necrosis is considered to be correlated with leaf roll, and it is a first season symptom following leaf roll infection.

A diplanetic species of Phytophthora causing pink rot of potato tubers, C. DRECHSLER (*Phytopathology, 19 (1929), No. 1, p. 92*).—A note is given of a species of Phytophthora isolated from potato tubers, which produces two forms of zoospores.

Bacterial spot of radish and turnip, H. E. WHITE and M. W. GARDNER (*Phytopathology, 19 (1929), No. 1, p. 97*).—A bacterial spot disease of radish and turnip is reported from Indiana. Inoculation tests showed that the organism could also infect cabbage, Brussels sprouts, cauliflower, mustard, and tomato.

Another bacterial leaf spot of sorghum, C. ELLIOTT (*Phytopathology, 19 (1929), No. 1, p. 82*).—A bacterial disease of sorghum due to an apparently undescribed organism is reported from Texas, Oklahoma, and Kansas.

Studies on bacterial pustule of soy bean, S. G. LEHMAN (*Phytopathology, 19 (1929), No. 1, p. 96*).—While pustular outgrowths are usually characteristic of the disease of soybeans caused by *Bacterium phaseoli sojense*, the author reports having isolated the organism from lesions which showed no trace of such outgrowths. The organism was found to survive in leaves kept in the laboratory for 9 months and in leaves which were subjected to weathering and decay for 3 months. Seed treatments failed to control the disease. The variety Columbia is reported as highly resistant.

Restoration of virulence of attenuated curly-top virus by passage through Stellaria media, C. F. LACKEY (*Jour. Agr. Research [U. S.], 44 (1932), No. 10, pp. 755–765, figs. 4*).—According to the author, virulent virus of the sugar beet curly top disease was attenuated by passing it through *Chenopodium murale*. Experimental evidence indicated that this attenuation was due to a change in the quality of the virus rather than to the quantity of the virus involved. The attenuated virus remained stable even though passed through successive generations of very susceptible sugar beets. The attenuated virus was restored to its original virulence by passing it through *S. media*. Virulent virus passed through *S. media* remained unchanged. The incubation periods of the virulent and restored forms of the virus were practically of the same length, but the attenuated virus had a much longer incubation period. The average weight per beet by plants infected with the attenuated virus was almost three times that attained by beets inoculated with either the virulent or the restored forms of the virus. Tests of the virus from a beet infected with the restored virus which showed somewhat milder symptoms than normal indicated that the virus involved was as virulent as that in the companion beets that were infected with the same virus and showed the typical severe symptoms.

S. media is considered of little importance in restoring the virulence of the virus under natural conditions.

Delayed thinning as a means of controlling damping-off of sugar beets, S. B. NUCKOLS and C. M. TOMPKINS (*Phytopathology, 19 (1929), No. 1, p. 95*).—Three years' experimental work in Utah and Washington are said to indicate that good stands of sugar beets may be obtained by delaying thinning until the seedlings have developed about six leaves. In thinning at this time seedlings with bowed leaf petioles should be removed, leaving only the largest healthy plants.

Further studies on the dry-rot canker of sugar beets, C. M. TOMPKINS (*Phytopathology, 19 (1929), No. 1, pp. 94, 95*).—Studies of the dry-rot canker (*Corticium vagum*) of sugar beets are said to indicate at least two distinct strains of the fungus. The organism apparently becomes pathogenic only in the presence of high soil temperatures. It is soil borne, and rotations have not been successful for its control. The breeding of resistant strains of sugar beets is believed to offer the most promising means of combating this disease.

Mosaic in relation to the new varieties of sugarcane P. R. 803, P. R. 807, F. C. 916, and S. C. 12(4) [trans. title], P. RICHARDSON KUNTZ (*Puerto Rico Dept. Agr. and Com. Sta. Circ. 96 (1932), Spanish ed., pp. 10, figs. 2*).—A comparison was made of the susceptibility to mosaic of several new varieties of sugarcane, S. C. 12(4), a susceptible variety, being used for comparison. In the experiments where 14.66 per cent of S. C. 12 (4) was affected, there was no mosaic on P. R. 807, 0.33 per cent on P. R. 803, and 4 per cent on F. C. 916.

Mosaic and its control in other cane growing countries, W. SAYER (*Agr. Jour. India, 24 (1929), No. 1, pp. 25–31*).—In view of the interest which cane mosaic is arousing in India, the author outlines the damage done to sugarcane interests in Java, Hawaii, Puerto Rico, South Africa, Argentina, Louisiana, Florida, and Cuba, with actual or presumably possible means and methods of combating this deteriorating disease.

The development of the spores of Plasmodiophora vascularum, M. T. COOK (*Phytopathology, 19 (1929), No. 1, pp. 91, 92*).—The development of *P. vascularum* in sugarcane is described.

Further studies on the control of stem rot of sweet potatoes, R. F. POOLE (*Phytopathology, 19 (1929), No. 1, p. 84*).—Stem rot, wilt, yellows, or root rot disease of sweetpotatoes caused by *Fusarium batatatis* was prevented by dipping the stems and roots of the slips in a 20–20–50 Bordeaux mixture. Some injury followed the use of a stronger mixture, but weaker ones were not so efficient. A 25 per cent monohydrated copper-lime dust gave equally as good control. The treatments were not efficient when diseased plants were used.

Migration of Bacterium tabacum through the leaf tissues of Nicotiana tabacum, J. B. HILL (*Phytopathology, 19 (1929), No. 1, p. 97*).—A study was made of the migration of *B. tabacum* through the tissues of its host. It was found that the bacteria migrate as zoögloeae from the region of inoculation and penetrate the intercellular tissues. The migration was found to be very slow when compared with that of the crown gall and fire blight organisms.

Are blackfire and angular leaf spot of tobacco identical? W. D. VALLEAU (*Phytopathology, 19 (1929), No. 1, p. 93*).—The author points out differences between black fire and angular leaf spot of tobacco. Attempted isolations from recently developed black fire spots failed to show the presence of *Bacterium angulatum*, the cause of angular leaf spot. Old spots sometimes yielded the organism, but this is believed to be due to contamination. Black fire spots are characterized by concentric rings, while typical angular leaf spots are not zonate.

Progress in the control of black shank of tobacco through disease resistance, W. B. TISDALE (*Phytopathology, 19 (1929), No. 1, p. 93*).—Continued selections and crossing work with a strain of Big Cuba, which is resistant to *Phytophthora nicotianae*, and Cuban and Connecticut Round Tip are said to have given progenies of superior leaf quality that are practically immune to black shank.

The black shank of tobacco in Porto Rico, J. A. B. NOLLA (*Phytopathology, 19 (1929), No. 1, pp. 93, 94*).—The author reports the presence in Puerto Rico of the disease of tobacco caused by *Phytophthora nicotianae*.

Local symptoms of mosaic in the leaves of some Nicotiana species, F. O. HOLMES (*Phytopathology, 19 (1929), No. 1, pp. 92, 93*).—Five species of Nicotiana, *N. rustica*, *N. acuminata*, *N. langsdorffii*, *N. sanderae*, and *N. glutinosa*, are said to show necrotic lesions where mosaic virus enters their tissues. *N. tabacum* does not show such lesions, but gives evidence of the effect of the virus by changes in leaf color at the site of inoculation and in the amount of starch formed.

A disease of tobacco seedlings caused by Septomyxa affinis (Sherb.) Wr., W. B. TISDALE (*Phytopathology, 19 (1929), No. 1, p. 90*).—A disease of tobacco seedlings in Florida is described. A similar disease reported from Connecticut, Kentucky, and Ohio has been attributed to a species of Fusarium. A study of the fungus of the Florida disease showed that it resembled *F. affine*, which is referred to the new combination *S. affinis*.

[Tobacco disease investigations], L. O. GRATZ (*Florida Sta. Rpt. 1931, pp. 176–180, figs. 6*).—Progress reports are given of field and laboratory studies of tobacco diseases and on variety tests with tobacco for resistance to black shank.

The diseases of tobacco in Puerto Rico [trans. title], J. A. B. NOLLA (*Puerto Rico Dept. Agr. and Com. Sta. Bul. 39 (1932), Spanish ed., pp. 29, figs. 7*).—The principal seed bed and field diseases of tobacco in Puerto Rico are described and suggestions given for their control.

The bacterial canker disease of tomatoes, C. M. HAENSELER (*N. J. State Hort. Soc. Proc., 1930, pp. 146–151*).—The tomato bacterial canker, not yet

destructive in New Jersey, is usually controlled by seed treatment with 1:2,000 corrosive sublimate (which should be followed by a surface wash) to remove surface contamination. Owing to the possibility of internal or soil infection, however, soil selection and the use of seed from noninfected plants are advised.

A preliminary report on forced-air ventilation for the control of Cladosporium leaf mold of greenhouse tomatoes, A. G. NEWHALL and J. D. WILSON (*Phytopathology, 19 (1929), No. 1, p. 83*).—Attempts to control with fungicides Cladosporium leaf spot of tomatoes grown in greenhouses having failed, the authors turned their attention to controlling the disease by reducing the humidity of the houses by ventilation, thus keeping the leaf surfaces comparatively dry. The installations successfully adopted are described.

A Stemphylium leaf spot of tomatoes, G. F. WEBER (*Phytopathology, 19 (1929), No. 1, p. 92*).—A description is given of a leaf disease of tomatoes caused by a species of Stemphylium. Inoculation experiments showed the parasitism of the fungus on peppers, groundcherries, eggplants, and *Solanum floridanum*, as well as on tomatoes. Weekly applications of a 4-4-50 Bordeaux mixture controlled the disease.

Investigations on "spotted wilt" of tomatoes, II, J. G. BALD and G. SAMUEL (*Aust. Council Sci. and Indus. Research Bul. 54 (1931), pp. 24, figs. 11*).—The first section of this work has been noted (E. S. R., 64, p. 359). In the present portion the authors add to the list of naturally, also artificially, infected hosts of tomato spotted wilt the Iceland poppy, nasturtium, and zinnia.

"Of particular interest is the fact that *Frankliniella insularis* to become infective to tomato must feed on diseased plants as a larva, as it is not infective if it feeds on diseased plants only as an adult thrips. With this additional information on transmission, and also the fact that the incubation period of the virus in *F. insularis* was found to be between five and seven days, the authors are repeating transmission studies with other species of thrips. As a result, since this bulletin was first submitted for publication, *Thrips tabaci* has been confirmed as a vector of spotted wilt, as was originally claimed by Pittman [E. S. R., 60, pp. 444, 834]." Experimentation with the insect vector has been noted (E. S. R., 67, p. 430).

Spotted wilt has been experimentally transmitted from tomato to *Nicotiana tabacum* and 14 other species of *Nicotiana*, also to 7 species of *Solanum* and to *Capsicum annuum*, *Datura stramonium*, *Hyoscyamus niger*, *Lycium ferocissimum*, *Petunia hybrida*, *Physalis peruviana*, *Salpiglossis* sp., and *Schizanthus* sp.

The host range includes members of Solanaceae, Papaveraceae, Tropaeolaceae, and Compositae.

Further studies on watermelon wilt in Iowa, D. R. PORTER and I. E. MELHUS (*Phytopathology, 19 (1929), No. 1, p. 84*).—Tests of commercial varieties of watermelons showed that all were susceptible to wilt. Two edible foreign varieties proved resistant. Some crosses between resistant and susceptible varieties appeared to possess considerable resistance. The soil temperature relations for wilting are discussed.

Some fruit diseases of the year, W. H. MARTIN (*N. J. State Hort. Soc. Proc., 1930, pp. 33–42*).—This report, with discussion, deals with apple scab and control studies, fruit spot, and cedar rust; also with peach bacterial spot and yellows.

The more important diseases of apples in Tennessee, C. D. SHERBAKOFF (*Tennessee Sta. Bul. 145 (1932), pp. 54, figs. 12*).—The more important diseases of the apple in Tennessee are described in nontechnical language, and on the

basis of results of 8 years' spraying experiments and observations over 11 years, suggestions are given for the control of the different diseases.

Some modifications are suggested for the present spray schedules that are thought to be advantageous. The author recommends spraying of trees in full bloom with a 1-3-50 Bordeaux mixture, without any insecticide, for the partial control of fire blight of blossoms, and as an extra spray for the control of scab; and the use of iron sulfate and lime-sulfur combined instead of lime-sulfur alone for the early foliage sprays.

In addition to spraying, attention should be given to orchard location, sanitation, tree spacing, and pruning, and the use of resistant varieties for disease control.

Progress report on studies of fireblight of apple, P. W. MILLER (*Phytopathology, 19 (1929), No. 1, pp. 86, 87*).—As a result of three years' study, the author claims that under Wisconsin conditions meteoric water is an important agency in disseminating primary and secondary infections by fire blight. Evidence was found that cutting out primary sources of infection and the application of chemicals to destroy those sources which were overlooked will aid materially in controlling the disease.

Recent progress in the control of Jonathan breakdown, R. C. PALMER (*Wash. State Hort. Assoc. Proc., 26 (1930), pp. 99–103*).—Though susceptibility of Jonathan apples to Jonathan breakdown is increased by conditions promoting very vigorous growth, this trouble can be prevented by picking at the proper stage of maturity, a fairly reliable index of which is the ripening change that shows on the unblushed side of the apple. Fruit from trees carrying the lighter crop must be picked earlier, but the harvesting of fruit produced by heavily loaded trees must not be delayed until very late in the season. Storage at low temperatures delays but does not prevent Jonathan breakdown.

Rust diseases of the apple, H. E. THOMAS and W. D. MILLS (*Phytopathology, 19 (1929), No. 1, p. 87*).—The authors report that in eastern New York the apple is subject to three rust diseases caused by *Gymnosporangium juniperi-virginianae*, *G. globosum*, and *G. germinale*.

Studies of the fungicidal action of certain dusts and sprays in the control of apple scab, J. M. HAMILTON (*Phytopathology, 19 (1929), No. 1, p. 87*).—Greenhouse experiments with potted apple trees showed that the leaves treated with sulfur dusts or lime-sulfur spray before infection were protected until the leaves became resistant. Lime-sulfur gave good control when applied 72 hours after infection, and in this respect it was more efficient than sulfur dusts, colloidal sulfur sprays, copper sprays, oils, or any mercury compounds tested.

No significant increase in fungicidal efficiency of sulfur followed the addition of potassium permanganate as an oxidizing agent. Bordeaux mixture and lime-sulfur were more adhesive than sulfur dusts, colloidal sulfur sprays, oils, or other combinations. Temperature was found to influence the development of the host and its parasite and the progress of the disease more than it affected the fungicidal action of sulfur.

Third progress report of studies of fall applications of fungicides in relation to apple scab control, G. W. KEITT and E. E. WILSON (*Phytopathology, 19 (1929), No. 1, pp. 87, 88*).—Tests of calcium arsenite showed that it was very efficient in preventing the development of the perithecia of *Venturia inaequalis* on apple leaves. On account of its high toxicity this substance is not recommended for commercial trial, and caution is advised as to its experimental use.

Apple scab control in the Bristol Province: Field trials, 1930, R. W. MARSH (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1930, pp.*

162–173, pls. 4).—In an investigation by means of field trials in Somerset, Worcestershire, and Herefordshire regarding the possibility of controlling apple scab with two preblossom sprays and one postblossom spray, good results were obtained when the sprays were applied at the green flower, the pink, and the petal fall stage, though the effect was less when the first application preceded the green flower stage.

Exposure of vaselined slides showed that conidia from wood pustules were present in the air around Cox and Worcester trees when the first leaves were unfolding. No ascospores were caught from overwintered leaves. The relation of the time of spraying to the presence of the spores is considered.

Some consideration of costs is given, with discussion of the advantages of early spraying. Diagrams illustrate a method of estimating scab damage, also a nomenclature for blossom bud stages.

Spraying trials against apple and pear scab at Long Ashton.—III, Season 1930, R. W. MARSH (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1930, pp. 151–161*).—"The continuation of spraying experiments [E. S. R., 67, p. 413] and the highly successful control of scab obtained on the same plats for two years in succession led to the attempt in 1930 to establish the cumulative effect of scab-control treatments. In order to determine this effect, certain varieties not highly susceptible to scab, on plats which had been practically clean in 1929, were either left unsprayed or given a light spraying program. The scab-susceptible varieties were given two, or three, sprayings as in 1929."

Details are given as regards the results of this third year's work, which is said to have afforded striking evidence of the cumulative effect of spraying against scab, though it is admitted that the addition of aluminum sulfate to a lime-sulfur spray does not obviate sulfur damage to the variety Lane Prince Albert. An example is recorded of Bordeaux injury to the fruit of Worcester Pearmain. The use of spray guns with a power outfit as compared with the use of lances effects a time saving of from 33 to 50 per cent with no increase of spray injury. Excellent control of scab on pears was obtained by use of Bordeaux mixture, one spraying before and one after blooming.

A fruit rot of apples and pears due to a variety of Phytophthora syringae, L. OGILVIE (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1930, pp. 147–150, pls. 2*).—In the autumn of 1929 a pear and apple fruit rot somewhat resembling the brown rot due to *Monilia fructigena* was very prevalent in southwest England. It was observed first at Long Ashton late in October and later on windfalls. Fruits on the trees were not affected except those near the ground in case of Allington Pippin. Diseased fruits of many varieties were sent from Somerset, Devonshire, Wiltshire, and Herefordshire. The disease was largely prevalent also on the cider apples and perry pears sent from south England and South Wales, about 2 per cent of the fruit samples being affected. The symptoms are described.

Previous references noted are thought to show that there are in England two Phytophthora rots of apples and pears, caused, respectively, by *P. cactorum* and by a strain of *P. Syringae*, the latter here reported as being very prevalent in the southwest. Apparently the infection originates largely from the soil in both cases. The disease develops after about a month in storage. The control measures indicated are preventing soil contamination and culling of diseased fruits from the storage trays at frequent intervals.

Elsinoe on apple and pear, A. E. JENKINS (*Jour. Agr. Research [U. S.], 44 (1932), No. 9, pp. 689–700, pls. 3, fig. 1*).—*Plectodiscella piri*, which causes apple and pear anthracnose, is said to be widely distributed in Europe. It

occurs also in South America, but is not known to be established in North America. A description of the disease and the taxonomy of the fungus are given, and it is believed that the various names which have been given the fungus causing this disease are synonyms of *Elsinoe piri*.

Observations of apple and pear diseases under overhead irrigation, C. P. HARLEY and E. L. REEVES (*Wash. State Hort. Assoc. Proc., 26 (1930), pp. 48–50*).—It is emphasized in this contribution from the U. S. D. A. Bureau of Plant Industry that the observation and study have been tentative only and confined to one season. As regards the relation of perennial canker to irrigation, no definite information is available. The overhead-sprinkled plants showed some superiority at harvest time as regards absence of powdery mildew markings on Jonathan apples, but more terminal infection. Fire blight was found active as late as July 28 in a pear orchard using overhead sprinklers. Downy mildew (*Phytophthora cactorum*), comparatively new in the Wenatchee district, was found to be more prevalent in an overhead-irrigated orchard than in those using the rill system.

Control of powdery mildew on Anjou pears, W. J. HAMMIL and E. L. REEVES (*Wash. State Hort. Assoc. Proc., 26 (1930), pp. 85, 86, fig. 1*).—Losses in 1928 led to practical field tests in 1929, as outlined by D. F. Fisher. These were continued in 1930 and were conclusively beneficial in this susceptible district as to control of powdery mildew on Anjou pear trees aged about 15 years, the treated plats showing, respectively, 2.33 and 8.4 per cent while the control plat showed 47.95 per cent total mildew.

[A Monilia on apricot], L. GUYOT (*Jour. Agr. Prat., n. ser., 51 (1929), No. 16, pp. 319, 320*).—A descriptive account is given of a desiccating attack, in forms which are described, by a Monilia on apricot blooms, branches, and fruits. Early spraying with Bordeaux mixture at 2 per cent is considered sufficient.

The effect of sprays on the weight of cherry fruit, E. E. WILSON and G. W. KEITT (*Phytopathology, 19 (1929), No. 1, p. 88*).—Five years' studies on the effect of lime-sulfur and Bordeaux mixture on cherry fruits showed variations from year to year, but generally the fruits from trees sprayed with lime-sulfur were heavier than those from trees treated with Bordeaux mixture. The differences were confined to the flesh of the fruits, the pits showing no significant variation.

Some raspberry mosaic symptoms, C. W. BENNETT (*Phytopathology, 19 (1929), No. 1, p. 89*).—Symptoms of some forms of raspberry mosaic are briefly described. Yellow mosaic is said to be very virulent and is readily distinguished from other types. Some of the more severe types of mosaic on raspberries are thought to be caused by a combination of two or more viruses.

Virus diseases of raspberry in Washington, L. K. JONES and G. A. NEWTON (*Wash. State Hort. Assoc. Proc., 26 (1930), pp. 196–199*).—In this contribution from the Washington College Experiment Station, it is stated that virus diseases cause serious losses to the raspberry industry and a decline in culture corresponding to that outlined as occurring in the eastern part of the United States. A survey made during the summer of 1929 in the vicinity of Sumner and Puyallup and in the area from Yelm to Bellingham is outlined. "It is apparent that virus diseases are very damaging to the black raspberry industry in this area." In the Spokane Valley the source of the damage is said to be traceable largely to plants from one diseased planting.

Verticillium wilt of strawberries, H. E. THOMAS (*California Sta. Bul. 530 (1932), pp. 16, figs. 4*).—A serious disease of strawberries in California is described. From the crowns of wilting and dying plants a fungus was isolated

that was indistinguishable in its growth characteristics from *V. alboatrum*, and by growing plants in soil inoculated with the Verticillium the disease was reproduced. The relation of the fungus to the host plant and the relation of wilt to root troubles in California and elsewhere are discussed.

Considerable resistance to the disease is reported for certain varieties of the strawberry, and the using of resistant varieties, avoiding planting in the field or propagating bed where other known hosts of the fungus have been grown, and rotations with nonsusceptible crops are suggested as means for control.

Strawberry disease in Lanarkshire, I, II (*Scot. Jour. Agr., 13 (1930), No. 3, pp. 242–251, pls. 3*).—This is in two parts.

I. *Field investigations*, D. V. Howells (pp. 242–247).—This outlines the local history of strawberry culture, culture methods, varieties and also the so-called Lanarkshire economics; disease as regards occurrence and incidence, field symptoms, economic bearing, and experimental work. The experiments included tests of spray materials; partial soil sterilization methods; manurial treatment coupled with soil sterilization and spray methods; cultivation methods, drainage, and manurial treatment; isolation and treatment of infected areas; and varietal tests for susceptibility or immunity.

*No spray material gave permanent benefit, though lime-sulfur and soil sterili*zation gave partial and temporary control. Of soil sterilizers, the most effective was cresylic acid, formaldehyde giving little benefit. Lime on heavy soils greatly improved root development, though on light soils it was either detrimental or of no effect. Additional drainage or deep cultivation gave no permanent improvement. Heavy applications of stable manure were detrimental. Isolation of infected areas gave temporary check.

II. *Phytophthora disease*, N. L. Alcock and C. E. Foister (pp. 247–251).—Outline discussion is given of symptoms noticeable in the field or in the plant, also of the fungus (which closely resembles *P. cinnamomi*) believed to cause the chestnut disease "inchiostro" (ink disease) in Italy, and which is said to be possibly controllable by selection of manures.

A Sclerotinia limb blight of figs, J. J. Taubenhaus and W. N. Ezekiel (*Phytopathology, 21 (1931), No. 12, pp. 1195–1197, fig. 1; abs. in Texas Sta. Circ. 61 (1931), p. 25*).—A blight of fig limbs is described as found to be caused by *S. sclerotiorum*. Natural infection in the field was apparently caused by ascospores discharged by apothecia found near infected trees.

Dieback of citrus, B. R. Fudge (*Florida Sta. Rpt. 1931, pp. 57, 58*).—A progress report is given of investigations carried on during the year.

Decay of citrus fruits in transit, H. R. Fulton and J. J. Bowman (*Phytopathology, 19 (1929), No. 1, pp. 89, 90*).—Data are given of the rots of citrus fruits caused by *Penicillium digitatum*, *P. italicum*, *Phomopsis citri*, and *Diplodia natalensis*, and the effectiveness of various control measures is discussed. Diplodia stem-end rot was reduced 50 per cent or more by early spring removal of deadwood in which the fungus sporulated. Phomopsis stem-end rot was reduced 50 per cent or more by one application of Bordeaux mixture to very young fruit. Both types of stem-end rot were reduced 90 per cent or more by prompt removal of the stem buttons after picking. Chemical treatments in packing houses reduced stem-end rots and blue mold rots very greatly. Precooling and refrigeration are important protective measures during transit and marketing. Promptness and care in handling at all stages are essential in successfully combating rots of citrus fruits.

An anthracnose of the jujube, J. J. Taubenhaus and W. N. Ezekiel (*Phytopathology, 21 (1931), No. 12, pp. 1185–1189, figs. 2; abs. in Texas Sta. Circ. 61 (1931), p. 25*).—A serious anthracnose disease of jujube fruit, resulting

in premature shedding, was found to be caused, at least in part, by a Gloeosporium. Normal jujube fruits, as well as apples, figs, grapes, Japanese persimmons, peppers, tomatoes, grapefruits, and oranges were successfully inoculated with the spores of the fungus isolated from the jujube fruit. No asci were found on infected fruit or in culture, but in general appearance and behavior the fungus appeared to be the same as or closely related to *Glomerella cingulata*, the cause of bitter rot of apples.

Calla lily root rot and its control, P. E. Tilford (*Ohio Sta. Bimo. Bul. 157 (1932), pp. 138-140, fig. 1*).—The rot disease of calla lilies which has become prevalent in Ohio, caused by *Phytophthora richardiae*, is described. The roots of the plants are infected, the rot progressing backward toward the corms, but the corms are not usually extensively invaded. Experiments for the control of the trouble are reported in which corms were treated with corrosive sublimate, formaldehyde, and an organic mercury compound showed that all reduced the amount of root rot, but in the experiments formaldehyde and corrosive sublimate were the more efficacious. The author suggests the growing of callas in pots rather than in benches if root rot is prevalent.

Iris rust, Puccinia iridis, E. B. Mains (*Phytopathology, 19 (1929), No. 1, p. 101*).—Studies of a number of species of Iris reported as hosts of *P. iridis* showed marked differences in susceptibility and immunity to the rust. Physiologically distinct forms of the rust are indicated.

The basal rot of narcissus bulbs caused by Fusarium sp., F. Weiss (*Phytopathology, 19 (1929), No. 1, pp. 99, 100*).—Field studies are said to have shown that infection of the roots and basal plates of narcissus may begin in the field, and that subsequent handling and storage of the bulbs only modify the course the infection may take. The organism appears to be restricted to narcissus, injuries favor but are not indispensable to infection, and varieties differ in susceptibility to basal rot.

The relation of the hot-water treatment of narcissus bulbs to basal rot, F. Weiss (*Phytopathology, 19 (1929), No. 1, p. 100*).—A study was made of the hot-water treatment of narcissus bulbs for the control of eelworms and bulb flies in relation to the control of basal rot. The microconidia of *Fusarium* sp., the cause of the disease, were found to retain their viability in water at 110° F. for eight hours. The introduction of a fungicide into the water used for controlling eelworms is suggested as a means of preventing the contamination of healthy bulbs.

Further studies of privet anthracnose, A. J. Mix (*Phytopathology, 19 (1929), No. 1, p. 102*).—Inoculation experiments with *Glomerella cingulata* from privet and apple proved that an unknown variety of privet was as susceptible to anthracnose as is the common European privet. *G. cingulata* isolated from the apple was pathogenic to both kinds of privet, but somewhat less so than when isolated from privet.

Anthracnose of the snowberry (Symphoricarpos albus var. laevigatus), W. H. Davis (*Phytopathology, 19 (1929), No. 1, pp. 101, 102*).—A disease of snowberry is reported and the fungus is briefly described. An examination of diseased fruits indicated that the fungus is probably a species of Gloeosporium.

The occurrence of violet root rot in central Texas, B. F. Dana and S. E. Wolff (*Phytopathology, 21 (1931), No. 5, pp. 557, 558, fig. 1; abs. in Texas Sta. Circ. 61 (1931), p. 20*).—*Rhizoctonia crocorum*, the cause of violet root rot, was found on a number of species of native weeds growing in the lowlands of central Texas. In the areas with abundant moisture the fungus was found prevalent on roots in the first 4 to 6 in. of soil, but on digging to a depth of

20 in. mycelium was found in abundance, indicating that the fungus parasite is favored by ample moisture.

Canker of ash trees produced by a variety of the olive-tubercle organism, Bacterium savastanoi, N. A. Brown (*Jour. Agr. Research* [U. S.], *44* (*1932*), *No. 9, pp. 701–722, figs. 7*).—A bacterial organism isolated from a canker disease of the European ash tree was found infectious to the American ash, causing the same type of lesion. The organism isolated from the ash cankers resembles that which produces tubercles on olive trees in California, Italy, and other countries. While the organisms do not cross-inoculate, both cultural and morphological tests show that they are quite similar. The ash-canker organism is described as a variety of the olive-tubercle organism, and the name *B. savastanoi fraxini* is suggested for it.

Outbreak of Loranthaceae on bamboo [trans. title], [C.] von Tubeuf (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 40* (*1930*), *No. 8, pp. 356–363, figs. 5*).—An account is given of *Struthanthus concinnus* attacking bamboos in Brazil.

The danger from Rhabdocline to Douglas fir in Germany [trans. title], [C.] von Tubeuf (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 40* (*1930*), *No. 8, pp. 390–394, figs. 2*).—The *Rhabdocline* sp. reputed to attack Douglas fir in the United States and to have spread previously to the south of England is said to have been found in the spring of 1930 in the Netherlands and in two places in Germany. The situation in its various bearings is discussed.

Gnomonia pseudoplatani n. sp. on maple leaves [trans. title], [C.] von Tubeuf (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 40* (*1930*), *No. 8, pp. 364–375, figs. 7*).—The author gives a descriptive and discussional account of a fungus designated as *G. pseudoplatani* which is said to be present in a leaf spot of *Acer pseudoplatanus*, showing a situation somewhat similar to but severer than that due to infection with *Gnomonia veneta* (*Gloeosporium nervisequum*).

Parasitism of Conopholis americana Wallr. on roots of Quercus bicolor Willd., K. D. Doak (*Phytopathology, 19* (*1929*), *No. 1, p. 102*).—The effect of *C. americana*, a parasitic phanerogamic plant, on oak roots is described.

Short branch in pines, I, II [trans. title], [C.] von Tubeuf (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 40* (*1930*), *No. 11, pp. 465–492, figs. 28*).—Two papers are here presented.

I. *Dormant eyes* (pp. 465–484).—The author has followed up the possibility which suggested itself in the course of work which has been noted (E. S. R., 67, p. 371), that the stimulus eventuating in the pseudomedullary ray (scheinmarkstrahl) is concerned also in the development of the abnormal knot or bunch formation of leaves and associated structures (knollenmaserbildung) on young pine shoots. Both the exterior appearances and internal relations are shown, with details and discussion.

II. *The outgrowth of dormant eyes in short branch* (pp. 485–492).—Generally the short branch condition of pines persists, since the apical bud anlagen remain dormant and develop only under conditions favorable to growth, as in the case of failure or hindrance of the main shoot. Such cases are here dealt with as regards both external and internal phenomena.

A fungous disease of conifers related to the snow cover, J. H. Faull (*Phytopathology, 19* (*1929*), *No. 1, p. 91*).—A blighting of spruces by a species of Phacidium resembling *P. infestans* is reported in northeastern America. Late fall applications of lime-sulfur and suitable sanitary measures controlled the disease in nurseries and plantations.

Effects of some environmental factors on the root-knot nematode, G. H. Godfrey and H. T. Morita (*Phytopathology, 19* (*1929*), *No. 1, pp. 83, 84*).—It is

claimed that sunlight and drying destroy all stages of *Heterodera* (*Caconema*) *radicicola*, and that greenhouse soils may be rid of the nematodes in four months by drying and stirring so as to bring about the complete drying of the soil.

A nematode root lesion of pineapple and other crops, G. H. Godfrey (*Phytopathology, 19 (1929), No. 1, p. 94*).—Root lesions caused by a species of Tylenchus are said to be contributing factors to root failure of pineapple plants in Hawaii. The presence of nematode root knots caused by *Heterodera* (*Caconema*) *radicicola* favors the penetration and development of Tylenchus.

Transmission of nematodes via seed [trans. title], H. Goffart (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 40 (1930), No. 9–10, pp. 401–416, figs. 3*).—An account of studies on nematodes includes information regarding other forms than Aphelenchus (E. S. R., 67, p. 402), more particularly certain of the parasitic forms as related to the question of transference by the seed. *Anguillulina* sp. was found in connection with the seed, as also were forms more or less harmless though undesirable.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Introduction to ornithological nomenclature, M. F. Coble and C. S. Life (*Los Angeles: Wm. B. Straube Ptg. Co., 1932, pp. V+91*).—This publication, primarily a dictionary of ornithological scientific names—their pronunciation and derivation (pp. 19–91), deals as an introduction with structural characters, color, markings, habitat, characterizations, food, places included in scientific names, and persons for whom named.

Our friend the frog, D. M. Cochran (*Natl. Geogr. Mag., 61 (1932), No. 5, pp. 628–654, pls. 8, figs. 16*).—This account of the frog, its biology and economic importance, includes descriptions of numerous species. The illustrations include eight plates in colors.

Report of the department of biology, T. C. Nelson (*New Jersey Stas. Rpt. 1931, pp. 111–122, figs. 5*).—Findings in oyster investigations in Delaware Bay in 1930 are summarized under the headings of spawning and setting, coated egg crate partitions as cultch, effect of copper and iron salts on setting, test of Barnegat Bay water for effect on setting, and the effect of the halicline upon horizontal distribution of the oyster larvae. Reporting upon the progress of oyster investigations in Barnegat Bay in 1930, E. B. Perkins discusses the restoration of spawning beds, spawning and brood histories, setting, and vertical distribution of oyster larvae. See also a previous note (E. S. R., 65, p. 751.)

[Notes on economic insects and their control] (*Jour. Econ. Ent., 25 (1932), No. 2, pp. 412–418*).—The contributions here noted are as follows: Harmolita Species in Rye Grass, by W. W. Jones (p. 412); *Eucosma argentialbana* Wlsm. as a Pest on Chrysanthemums, by G. M. List (p. 412); Control of the Red Spider Mite [Common Red Spider] and the Citrus Mealybug on Greenhouse Plants, by H. H. Richardson (p. 412); An Observation of a Maggot, *Rhagoletis pomonella* Walsh, Passing from One Blueberry into an Adjacent Blueberry, by L. C. McAlister, jr. (pp. 412, 413); The Apparent Incompatibility of Barium Fluosilicate and Nicotine Sulphate, by F. S. Chamberlin (p. 413); An Observation on the Hibernation of the Corn Earworm in Maryland, by L. P. Ditman (p. 413); Introduction of *Eretmocerus serius* Silv. into Haiti, by H. L. Dozier (p. 414); *Alysia ridibunda* Say, Parasitic on Blowfly Larvae, by A. W. Lindquist (pp. 414, 415); Pyrethrin Sprays in the Control of Greenhouse Pests, by H. H. Richardson (p. 415); A Second Report on Burying Peach Drops to Prevent the Escape of Plum Curculio Adults, by O. I. Snapp and J. R. Thomson (pp. 415, 416) (E. S. R., 65, p. 453); Bound

Water, by R. W. Salt and E. H. Hinman (pp. 416, 417); Indications of a Control Measure for *Tarsonemus pallidus* Banks on Strawberry, by C. F. Doucette and W. W. Baker (pp. 417, 418); and A New Pest in Greenhouse Grown Grape Stems [*Xyleborus germanus* Blandf.], by E. P. Felt (p. 418).

[Report of work in entomology and parasitology] (*California Sta. Rpt. 1931, pp. 37–40, 67–72*).—Continuing earlier work (E. S. R., 65, p. 752) data are reported on imported parasites of the citrophilus mealybug and other pests; control of the red scale, walnut husk fly, and flower thrips *Frankliniella californica* attacking apricots; thrips attacking cherries; the effect of artificial light on the behavior of the codling moth; the apple leafhopper; the willow weevil *Stamoderes uniformis* Casey as an apple pest; leaf rollers (*Pandemis pyrusana* Kearf.) in an apple orchard; pear blister mite control; the grape leafhopper; Pacific red spider (*Tetranychus pacificus* McG.); garden centipede (*Scutigerella immaculata* Newp.); beet leafhopper; pepper weevil; toxicity of arsenic on mosquito pupae; summer oil and lead arsenate; bean thrips; mealy plum aphid; vegetable weevil; and control of the corn ear worm.

[Report of work with economic insects] (*Connecticut State Sta. Bul. 337 (1932), pp. 462–469, figs. 2*).—This report deals briefly with the work of distributing parasites of the oriental fruit moth, including 11,500,000 egg parasites (*Trichogramma minutum*) and 10,000 larval parasites (*Macrocentrus ancylivora*); with control of the Mexican bean beetle; European corn borer increase; mosquito control extension; Asiatic beetle in new territory; four new towns infested by the Japanese beetle; gipsy moth spread; bee disease reduction; and the European shoot moth.

[Report of work with economic insects and rodents] (*Florida Sta. Rpt. 1931, pp. 67, 68, 70–80, 149–152, 160–163, figs. 2*).—The progress of work on control of cotton boll weevil is given by E. F. Grossman (E. S. R., 66, p. 855); on Florida flower thrips and root knot investigations, by J. R. Watson; on introduction and study of *Cryptolaemus montrouzieri*, by W. L. Thompson; on the larger plant bugs on citrus and truck crops, by H. E. Bratley; on control of the bean jassid, by A. N. Tissot; on the green citrus aphid *Aphis spiraecola*, by Thompson and L. W. Zeigler; on control of deciduous fruit and nut crop insects, including the nut case bearer (*Acrobasis* sp.), leaf case bearers (*Acrobasis* spp.), hickory shuckworm, black hickory aphid (*Melanocallis fumipennella*), pecan cigar case bearer, twig girdler, and the blueberry fruit worm *Acrobasis vaccinii*, all by F. W. Walker; mealybugs, by Watson; on the common red spider on *Asparagus plumosus* (E. S. R., 66, p. 254) and insects of ornamentals, by J. W. Wilson; on the melon aphid and mice as pests of watermelons, by C. C. Goff; on control of the insect pests of stored corn, by Grossman; and insect pests in the Everglades and their control, including cutworms, bean jassids, aphids, velvetbean caterpillar, and corn ear worm, studies upon the prevalence and control of the sugarcane moth stalk borer, and studies upon the prevalence and control of rodents under field and village conditions, all by R. N. Lobdell.

[Contributions on economic entomology] (*Fla. State Hort. Soc. Proc. 42 (1929), pp. 51–55, 152–158, 169–174; 43 (1930), pp. 100–114, 143–176*).—The contributions presented at the annual meeting of the Florida State Horticultural Society held in 1929 include the following: Some Methods and Insecticides to Control Citrus Aphids, by W. L. Thompson (pp. 51–55); Protecting Our Crops Against Foreign Pests, by F. Stirling (pp. 152–158); and Improvement of Citrus Fruit Grade from Standpoint of Pests, by J. R. Watson (pp. 169–174).

Those presented at the annual meeting held in 1930 are: Crotalaria and Pumpkin Bugs, by J. R. Watson (pp. 100–105); Reduced Cost in the Control of

Aphids, by W. L. Thompson (pp. 106–114); **Eradicating the Mediterranean Fruit Fly from Florida**, by W. C. O'Kane (pp. 143–148); **What of the Mediterranean Fruit Fly?** by W. Newell (pp. 149–158); **Fighting the Mediterranean Fruit Fly**, by B. L. Hamner (pp. 159–164); **Meeting the Fruit Fly Situation**, by S. L. Holland (pp. 165–173); and **Some Details of Fruit Fly Situation**, by H. H. Hume (pp. 174–176).

[Contributions on economic insects and their control] (*Ill. State Hort. Soc. Trans., 65 (1931), pp. 148–166, figs. 7, pp. 362–370, 437–454*).—The contributions here presented are as follows: Progress in Orchard Insect Control for 1931, by W. P. Flint and M. D. Farrar (pp. 148–166); Recent Developments in the Control of Garden and Truck Crop Insects, by L. H. Shropshire (pp. 362–370); and Insect Forecast for 1932 and Recommendations for Control, by W. P. Flint and S. C. Chandler (pp. 437–454).

[Report of work in entomology] (*Indiana Sta. Rpt. 1931, pp. 13, 28–32, 41, figs. 2*).—The work of the year in entomology is briefly referred to (E. S. R., 65, p. 152), including that with the European corn borer, codling moth, and oriental fruit moth.

[Contributions on economic insects and their control] (*Ky. State Hort. Soc. Trans., 1931, pp. 57–64, 66–90, 104–107*).—The contributions (E. S. R., 66, p. 346) presented include the following: Oriental Fruit Moth Situation, by W. A. Price (pp. 57–61); Avoiding a Codling Moth Infestation, by C. O. Eddy (pp. 66–71); Practical Control of Curculio, by M. D. Eblen (pp. 71–78); Our 1932 Spray Program, by W. W. Magill (pp. 78–90); and The Arsenical Residue Tolerance, by B. E. Niles (pp. 104–107).

[Contributions on economic insects and their control] (*Md. State Hort. Soc. Proc., 33 (1931), pp. 38–64, 74–87*).—The contributions presented include the following: Some Spraying Experiences in 1930, by A. J. Farley (pp. 38–50); The Life of a Codling Moth: At What Point in Its Life Can We Take Advantage of Its Weak Position? by W. S. Hough (pp. 50–56); The Prevalence of Codling Moth in Maryland and the Control Recommended, by E. N. Cory (pp. 56–64); and Problems and Experiences in Removing Spray Residue from the 1930 Apple Crop, by W. S. Hough and A. B. Groves (pp. 74–87).

[Report of work in entomology] (*New Hampshire Sta. Bul. 262 (1932), pp. 15, 16, 21*).—Brief reports are given on work with the European corn borer by W. C. O'Kane, contact insecticides, by O'Kane, W. A. Westgate, and E. C. Glover, and the spray service, by E. J. Rasmussen.

Report of the department of entomology, T. J. Headlee et al. (*New Jersey Stas. Rpt. 1931, pp. 30–36, 139–198, 201, 205–253, figs. 12*).—The mosquito investigations of the year reported upon (E. S. R., 65, p. 847) include an account of egg-laying habits of the fresh water mosquito *Aedes sylvestris*, mosquitoes of the year, and rainfall and its relation to mosquito production, all by F. W. Miller, followed by mechanical developments in mosquito control, including salt marsh ditching and a ditch recutting machine, and mosquito traps; airplane application of larvicide on mosquito breeding places inaccessible from land, by J. M. Ginsburg; the practical application of pyrethrum mosquito larvicide, by Ginsburg; and phases of practical mosquito control, by Miller. Insect and related pest accessions are listed by A. E. Meske and C. Ilg.

Climate and insect investigations, including the effect of radio waves on insects and plants, are next reported upon (E. S. R., 65, p. 454). Orchard insect investigations reported include references to work with the leopard moth, arsenical substitutes for codling moth, accounts of insecticide and parasite control work with the oriental fruit moth, by B. F. Driggers, also notes on the late plum curculio by the same worker.

In investigations of insecticides the stability of oil emulsion containing cresylic acid and copper fungicides and a study of waxes as possible carriers for insecticides are considered by Ginsburg.

Under the heading of vegetable insect investigations, the pepper maggot is considered by R. C. Burdette and the Mexican bean beetle briefly reported upon. Spraying to control the blunt-nosed leafhopper (*Euscelis striatulus* Fall.) on cranberry is dealt with by C. S. Beckwith and C. A. Doehlert.

In considering greenhouse insect investigations, C. C. Hamilton reports upon the habits and control of the orchid weevil *Diorymerellus laevimargo* Champ., the orchid scale *Aspidiotus hederae* Vall., control of mealybugs infesting gardenias, tests on thrips infesting carnations and on mites infesting Ardisia plants, and controlling the American cockroach in the greenhouse. A report on wireworms is made by Burdette.

Bee investigations reported upon by R. S. Filmer include the influence of colony strength on orchard activity, comparative activity of paired colonies of Italian and Caucasian bees at different temperatures, and breeding bees.

Investigations of insects injurious to ornamentals are considered by Hamilton, including insecticide investigations on insects infesting asters and dahlias, the European pine shoot moth, control of boring insects, and tests with spray materials upon ornamental evergreens at the Princeton Nurseries during the summer of 1930.

Much of these data are reported in tabular form.

[Contributions on economic insects] (*N. Y. State Hort. Soc. Proc., 77 (1932), pp. 25–36, 43–53*).—Two contributions presented in January, 1932, are as follows: Major Insect Problems, by P. J. Parrott (pp. 25–36), and Honeybees and Other Insects in the Orchard, by E. F. Phillips (pp. 43–53).

[Contributions on economic insects and their control] (*Oreg. State Hort. Soc. Ann. Rpt., 23 (1931), pp. 63–67, fig. 1, pp. 112–118*).—Two contributions are presented as follows: New Developments in Control of the Codling Moth, by E. J. Newcomer, and Management of Bees in the Orchard, by H. S. Scullen.

[Contributions on economic insects and their control] (*Penn. State Hort. Assoc Proc., 73 (1932), pp. 14–22, 24–32, 34–37, fig. 1, pp. 37–44, 46–49, 80–85, 109–111*).—The contributions here presented are as follows: A Report of Further Experiments with Chemically-Treated Bands for Codling Moth Control (pp. 14–21) and Some Tests of Spray Materials against San Jose Scale at the Pennsylvania State College (pp. 22, 24–26), both by H. N. Worthley; Old Ideas of Insect Control in a New Setting, by H. E. Hodgkiss (pp. 26–32, 34–37); The Future of Spray Residue Removal in Pennsylvania (pp. 37–44, 46–49) and Modern Developments in Spraying Practice (pp. 80–85), both by H. G. Ingerson; and How the State Department of Agriculture Checks Up on Arsenical Residues, by D. M. James (pp. 109–111).

[Contributions on economic insects in Tennessee and their control] (*Tenn. State Hort. Soc. Proc., 26 (1931), pp. 42–45, 84–89; 27 (1931), pp. 14–28, 75–80, 86–92*).—The following papers are here presented:

Vol. 26.—Peach Insects of Tennessee, by H. G. Butler, and The Use of Oils in the Apple Spray Program, by M. D. Farrar.

Vol. 27.—Oil Emulsions as Insecticides and Their Use for the Control of Scale Insects on Fruit Trees, by O. I. Snapp (pp. 14–28); Parasites of the Oriental Fruit Moth in Roane County, Tennessee, Harriman, Tenn., 1931, by H. G. Butler (pp. 75–80); and A Preliminary Report on Arsenical Substitutes for Peach Spraying, by S. Marcovitch and W. W. Stanley (pp. 86–92).

[Work with economic insects in Mauritius], A. MOUTIA (*Mauritius Dept. Agr. Ann. Rpt. 1930, pp. 7–10, pls. 2*).—This is a report on the occurrence of and work with the more important insects of the year in Mauritius.

Entomological research, D. J. ATKINSON (*Burma [Forest Dept.] Ann. Rpt. Working Plans, Silvic., and Ent., 1930–31, pp. 60–69*).—Under the heading of pests of teak, the bee hole borer (*Xyleutes ceramicus* Walk.), its life history, economic importance, and natural enemies, and defoliators, including *Hapalia machaeralis* Walk. and *Hyblaea puera* Cram. are first considered. This is followed by an account of other pests of teak, including *Aristobia approximator* Theob. and *Dihammus cervinus* Hope. Pests of other species of economic importance, particularly *Calopepla leayana* Latr., are noted.

Annual report of the entomologist, Research Bureau, Philippine Sugar Association, 1930–31, A. W. LOPEZ (*Philippine Sugar Assoc., Research Bur., Ann. Rpt. Ent., 1930–31, pp. 227–273, pls. 4, figs. 8*).—Under the heading of insects attacking cane below ground, the author deals particularly with *Leucopholis irrorata* Chevr., known as buc-an, which is now reported from Cebu and Panay as well as Negros. Observation of its biology, with a report of the reaction of the pest to various attrahents, is followed by additional information on natural enemies of white grubs, particularly scoliid wasps of the genus Campsomeris, colored illustrations of species of which are given on several plates, and on a hyperparasite of scoliid cocoons (*Trogaspidia minor* Ashm.). In addition to the account of *L. irrorata*, brief notes are given upon *Lepidiota pruinosa* Burm. and *Stephanopholis philippinensis* Brenske.

Under the heading of insects attacking cane above ground, the weevil borer *Trochorrhopalus strangulatus* Gyll. is briefly noted, followed by an account of three dead-heart borers, namely, *Olethreutes* (*Grapholitha*) *schistaceana* Sn., *Diatraea* (*Chilo*) *infuscatella* Sn., and *Sesamia inferens* Walk. The top borer, *Topeutes* (*Scirpophaga*) *intacta* Sn., is noted, together with four of its known parasites. Other enemies noted include the sugarcane pink mealybug (*Trionymus sacchari* Ckll.); the white leaf louse (*Oregma lanigera* Zehnt.); a sugarcane white fly, *Neomaskellia* (*Aleurodes*) *bergi* Sign., which is present in Negros; and the migratory locust (*Locusta migratoria* L.). A chart is attached which shows the seasonal periods of locust outbreaks, 1912–1931. Tables are given which show cane pests and their distribution in the Cebu, San Carlos, Bais, Danao, and Lopez districts. The report concludes with a seven-page table of the insects found in the sugarcane fields of the Philippines, with their known indigenous natural enemies.

Some problems and development in control of insects by chemicals, W. C. O'KANE (*Jour. Econ. Ent., 25 (1932), No. 2, pp. 232–243*).—A general discussion of the problems and the advancements in insect control.

Additions to our knowledge of the toxicity of stomach poisons to insects, J. W. BULGER (*Jour. Econ. Ent., 25 (1932), No. 2, pp. 261–268, pl. 1, figs. 2*).—In a study made of the effect of calcium hydroxide, calcium caseinate, precipitated sulfur, dry Bordeaux mixture, and hydrated ferric oxide on the toxicity of acid lead arsenate for the fourth instar silkworm, the so-called sandwich method was used. Certain improvements in this method are described.

"No remarkable effect was produced by any of these substances. It is fairly certain, however, that calcium hydroxide and calcium caseinate increase the toxicity of acid lead arsenate when mixed with it in approximately equal proportions by weight. The indications are that precipitated sulfur may increase the toxicity of acid lead arsenate, and that dry Bordeax mixture and hydrated ferric oxide may decrease it.

"Experiments were made . . . on the relative susceptibility to acid lead arsenate of the following caterpillars in the last instar: Eastern tent caterpillar

(*Malacosoma americana* Fab.), fall webworm (*Hyphantria cunea* Drury), walnut caterpillar (*Datana integerrima* G. & R.), and the catalpa sphinx (*Ceratomia catalpae* Boisd.). With the median lethal dose of acid lead arsenate for the fourth-instar silkworm as the standard of comparison, it was found that the first two insects were less susceptible and the last two more susceptible to acid lead arsenate than the fourth-instar silkworm. It was also shown that, although the median lethal doses of acid lead arsenate and cuprous cyanide are different for the catalpa sphinx and silkworm, their relative toxicity is about the same for each of these insects."

Experiments on the control of arsenical injury on peach, S. MARCOVITCH and W. W. STANLEY (*Jour. Econ. Ent.*, 25 (1932), No. 2, pp. 213–217, pl. 1).—In this report of work conducted at the Tennessee Experiment Station the authors call attention to the general belief that arsenic poisons the cell through its reaction with the sulfhydryl group (-SH) of glutathione. Since this material is closely allied with the growing process, nitrogenous fertilizers were used to stimulate growth in the hope of overcoming arsenical spray burn on peach. On poor soils, on which the injury from lead arsenate was most severe, the least burning was encountered where nitrogen was used.

The use of mineral oils for better dusts, W. P. FLINT and M. D. FARRAR (*Jour. Econ. Ent.*, 25 (1932), No. 2, pp. 269–271).—In the course of experimental control work with the oriental fruit moth an attempt was made to develop dusts with better sticking qualities than those ordinarily used for peach tree dusting. It was found that by the addition of small quantities of mineral oil such dusts could be applied by an ordinary orchard duster, much better adhesion resulting. Mineral oils of from 80 to 110 seconds viscosity have been found most desirable for dusting mixtures. White or saturated oils may be used, but the unsaturated oils or so-called straw oils have not caused injury in orchard dusting mixtures.

A number of tests with light lubricating straw oil dusts were carried on in 1930 on apple, peach, potato, and other plants without any injury resulting. "Combinations of oils with most of the standard orchard dusts have now been tested, including combinations of sulfur and oil; sulfur, arsenate of lead, oil; sulfur, lime, lead, oil; arsenate of lead, lime, monohydrated copper sulfate, and oil; and others. Because of the physical condition of the dust and the fact that the material must remain in a state where it can be applied as a dust, it has not been found practical to combine more than 5 per cent by weight of oil with the dusts. In order to combine as much as 5 per cent of oil in sulfur dusts, it has been found necessary to replace a part of the sulfur with hydrated dusting lime or other deflocculative material in order to give the mixture sufficient buoyancy for dusting. Dusts containing 60 per cent sulfur or 16 per cent monohydrated copper sulfate carry sufficient fungicidal material to give satisfactory control of many of the orchard diseases."

The tank-mixture method of using oil spray, R. H. SMITH (*California Sta. Bul.* 527 (1932), pp. 86, figs. 27).—The tank-mixture spray, in which the water, emulsifier or spreader, and oil are added separately to the spray tank and a uniform mixture produced and maintained by the agitators, has been employed for five years at the Citrus Experiment Station in experimental tests in comparison with several leading brands of proprietary emulsions and in regular control work on the station property. This method of using oil spray has been used in more than 300 experimental orchard tests, in the majority of which it was applied by commercial spray operators. From 1928 to 1930, inclusive, it received practical testing by growers in the spraying of approximately 4,500 acres of citrus trees. It is estimated that about one-third of all

spraying of citrus trees in the southern counties of the State in 1931 was done with tank-mixture spray.

In tests made with the black and citricola scales the most effective spray of the work (E. S. R., 64, p. 543; 66, pp. 156, 449, 850), much of the data being presented in tabular form. The subject is presented under the headings of a brief history of the use of oil sprays, the origin and development of the tank-mixture method, major qualities of oil spray, a study of agitation in commercial spray practice, experiments on spray tank agitation, the power required to operate agitators, a study of mixtures during passage through spray hose, the size of oil globules, factors governing quantity of oil deposited, methods for determining the quantity of oil deposited on (1) sections of glass by proprietary emulsions and (2) orange leaves by proprietary emulsions and tank mixtures, orchard tests on quantity of oil deposited, function of spreaders and emulsifiers in oil sprays, experiments with oil sprays in control of (1) black and citricola scales and (2) red scale, advantages and shortcomings of the tank-mixture method, and recommendations for the tank-mixture spray.

In tests made with the black and citricola scales the most effective spray was that of oil and water alone, only 0.03 per cent remaining alive. The spray containing calcium caseinate at the rate of 0.5 lb. to 100 gal. ranked second, the one containing blood albumen spreader at the rate of 6 oz. to 100 gal. ranked third, and blood albumen spreader at 12 oz. to 100 gal. gave the poorest control. The degree of effectiveness was proportional to the percentage of oil in the spray.

The average results for all tests made with the red scale indicate that the spray containing blood albumen spreader at the rate of 4 oz. to 100 gal. may have about the same degree of efficiency as the spray of oil and water only. The records show that the spray is least effective on the branches and most effective on the leaves. The insects on the twigs and fruit are much more easily killed than those on the bark. A large proportion of those found alive on the twigs and fruit were obviously missed by the spray.

The author recommends that the tank spray mixture spreader consist of 1 part of powdered blood albumen intimately mixed with 3 parts of fuller's earth, or a similar form of neutral earth. It should be from 96 to 100 per cent water soluble, should have a moisture content of not more than 6 per cent, and 90 per cent should pass through a 100-mesh screen. It should be used at the rate of 4 oz. to 100 gal. of spray. Oils of five grades of heaviness are needed to meet the various conditions of citrus pest control effectively, the specifications of which are tabulated. These grades are designated by number, No. 1 being the lightest and No. 5 the heaviest, grade 2 containing 25 per cent heavy oil, grade 3, 40 per cent, and grade 4, 60 per cent.

Attraction of certain insects to spray baits, R. C. Burdette (*Jour. Econ. Ent., 25 (1932), No. 2, pp. 343–346*).—It was found in work at the New Jersey Experiment Stations that the pepper maggot fly (*Spilographa electa* Say) and the corn ear worm can be attracted by use of invert sugar as a spray bait. Arsenicals added to this spray reduce the number of pepper flies. Insecticides added to the spray for corn ear worm moth did not give any kill.

Further studies of the effects of electro-magnetic waves on insects, T. J. Headlee (*Jour. Econ. Ent., 25 (1932), No. 2, pp. 276–288, pl. 1, fig. 1*).—In further work at the New Jersey Experiment Stations (E. S. R., 65, p. 454), the author was led to conclude that "soil and soil water heating is likely to prove a limiting factor in the use of electromagnetic waves against soil-infesting insects. Irradiation of foliage wall of the apple tree with ordinary white light in the amount of 10-ft. candles reduced fruit infestation by first brood codling

moth 50 per cent. Eggs are, however, frequently deposited in this intensity. Irradiation in the neighborhood of 30-ft. candles seems likely to be required to prevent free oviposition. The violet end of the spectrum excites the moth to apparently normal oviposition. The red end tends to produce abnormal activity with some egg laying.

Insect parasitology, W. B. Herms (*Jour. Econ. Ent., 25 (1932), No. 2 pp. 222–232*).—A general discussion.

Insect pests and green manuring, J. C. Hutson (*Trop. Agr. [Ceylon], 78 (1932), No. 3, pp. 129–146, pls. 5*).—The author deals briefly with some of the more important insect pests by which green manures are liable to be attacked and suggests control measures.

Observations on mushroom insects, C. A. Thomas (*Jour. Econ. Ent., 25 (1932), No. 2, pp. 322–331*).—This is a contribution from the Pennsylvania Experiment Station summarizing the biology and control of flies and springtails which injure cultivated mushrooms (E. S. R., 66, p. 756).

Pests of stored tobacco in Southern Rhodesia, M. C. Mossop (*Rhodesia Agr. Jour., 29 (1932), No. 4, pp. 245–265, pls. 2*).—In this account the author first deals at some length with *Ephestia elutella* Hbn., followed by an account of the cigarette beetle. It is said that while overseas *E. elutella* is known as a pest of cacao beans and peanut (Arachis) products, in Southern Rhodesia it is known only as a pest of tobacco at present. It is considered desirable that its common name should be associated with tobacco, and to this end the name stored tobacco worm is suggested.

Codling moth and San Jose scale, two orchard pests demanding close attention, E. N. Cory (*Md. State Hort. Soc. Proc., 34 (1932), pp. 57–63*).—This account, delivered before the Maryland State Horticultural Society in January, 1932, includes tables reporting the percentage of codling moth infestation and the results of tests against overwintering larvae inside their hibernacula.

An annotated list of the insects and arachnids affecting the various species of walnuts or members of the genus Juglans Linn., R. E. Barrett (*Calif. Univ. Pubs. Ent., 5 (1932), No. 15, pp. 275–309*).—In addition to this annotated list of 338 insects and Arachnida, representing 233 genera and 68 families which infest walnuts, systematically arranged, a brief history is given of walnut culture in which the natural distribution of the members of the genus Juglans is included and a bibliography of five pages appended.

[Contributions on shade tree insects] (*Natl. Shade Tree Conf. Proc., 7 (1931), pp. 41–44, 46–73, 115–134*).—The contributions presented at the seventh annual meeting of the National Shade Tree Conference, held at Yonkers, N. Y., and Stamford, Conn., in August, 1931, include the following: Some Prevalent Insect Pests of Shade Trees, by W. E. Britton (pp. 41–44); The Susceptibility of Shade Trees to Insects, by W. Middleton (pp. 46–56); The European Pine Shoot Moth, by R. B. Friend (pp. 56–59); The Relation of Spreading and Tracheal Penetration to the Efficiency of Contact Insecticides, by A. Hartzell (pp. 60–66); The Effect of Certain Important Insects on Trees, by E. P. Felt (pp. 66–73); Insecticides and Fungicides for Ornamentals, by E. P. Felt and S. W. Bromley (pp. 115–121); The Japanese Beetle Situation in 1931, by C. H. Hadley (pp. 121–125); Some Results Secured from Gipsy Moth Control and Extermination Work, by A. F. Burgess (pp. 126–128); Parasite Introductions for the Gipsy Moth and Some Other Forest and Shade-Tree Insects, by C. W. Collins (pp. 129–131); Insect Conditions in Ohio, by J. S. Houser (p. 131); The Catalpa Mealybug [*Pseudococcus comstocki* Kuwana], by N. Turner (pp. 132, 133); and the Birch Leaf Miner [*Fenusa pumila* Klug], by R. B. Friend (pp. 133, 134).

Insecticides on shade trees and ornamentals, E. P. Felt and S. W. Bromley (*Jour. Econ. Ent., 25 (1932), No. 2, pp. 298–304*).—In a series of tests conducted at Stamford, Conn., with a view to determining the tolerance of various trees and shrubs to dormant sprays, the sugar maple, black walnut, butternut, and beech proved to be very susceptible to oil injury, and certain conifers, particularly the spruces, were apt to be injured when excessive amounts were used. The other trees and shrubs sprayed with various oils at dormant strength were not injured by the application.

"Dormant oil 1–16 was very effective in killing the overwintering young of the tulip tree scale (*Toumeyella liriodendri*). The white pine bark aphid, *Adelges pinicorticis*, was very satisfactorily controlled with a dormant oil at 1–25, 1–50, and 1–50 to which was added nicotine sulfate (40 per cent) 1–800. Tests of several commercial sprays applied to spruce branches and the latter then immediately covered with paraffin bags resulted in no appreciable injury, indicating that high humidity was probably not an important factor in causing injury.

"A lead oleate coated arsenate of lead applied to twigs upon which feeding hickory bark beetles (*Scolytus quadrispinosus*) were confined resulted in appreciably more killing than in the case of others sprayed with ordinary arsenate of lead. A spray of 2 per cent summer oil plus nicotine sulfate 1–800 and a commercial vegetable oil-soap-nicotine sulfate mixture diluted 1–10 gave practically 100 per cent kill of young juniper scale, *Diaspis carueli*, in midsummer. A very satisfactory control, 95–100 per cent, was secured in the case of a number of insects by spraying with the vegetable oil-soap-nicotine spray."

Some chewing insects infesting Michigan evergreens, E. I. McDaniel (*Michigan Sta. Circ. 141 (1932), pp. 54, figs. 54*).—A practical summary which gives the more significant facts on the habits, life histories, and control of important chewing insects infesting conifers.

Insects infesting Pinus radiata in New Zealand, A. F. Clark (*New Zeal. Jour. Sci. and Technol., 13 (1932), No. 4, pp. 235–243, figs. 4*).—Notes are given on the introduced and indigenous insect enemies of *P. radiata* Don. in New Zealand.

Fumigation of the immature stages of clothes moths and carpet beetles with a mixture of ethylene dichloride and carbon tetrachloride, G. W. Herrick and G. H. Griswold (*Jour. Econ. Ent., 25 (1932), No. 2, pp. 243–248*).—In testing the new mixture brought to notice by Cotton and Roark (E. S. R., 58, p. 255), the authors found three parts by volume of ethylene dichloride to one part by volume of carbon tetrachloride to be a practical household fumigant for clothes moths and carpet beetles. When confined for 48 hours in an ordinary trunk, 2 fluid oz. to 5 cu. ft. proved toxic to eggs and larvae of the webbing clothes moth and to larvae of both the black and varied carpet beetles, even at temperatures somewhat below 70° F. Satisfactory results were also obtained when the mixture was used in a tight closet.

Cold storage of furs, C. A. Aspinwall (*Jour. Tech. Assoc. Fur Indus., 3 (1932), No. 1, pp. 6–13*).—A discussion of the use of cold air to protect furs, garments, rugs, and other articles from damage by clothes moths and kindred insects, first commenced by a storage company in Washington, D. C., in 1895.

Medical entomology: A survey of insects and allied forms which affect the health of man and animals, W. A. Riley and O. A. Johannsen (*New York and London: McGraw-Hill Book Co., 1932, pp. XI+476, pl. 1, figs. 184*).—This work, presented under a new name, is a complete revision and rearrangement of material presented in an earlier work (E. S. R., 32, p. 848).

Observations on a grasshopper outbreak in Minnesota, A. G. RUGGLES (*Jour. Econ. Ent., 25 (1932), No. 2, pp. 187–189*).—This contribution from the Minnesota Experiment Station is a report of a statistical survey made of 123 farms in the heavily infested grasshopper area of the State in 1931, with particular reference to the value of poisoned bran bait.

Devastation of a large area by the differential and the two-striped grasshoppers, J. R. PARKER and R. L. SHOTWELL (*Jour. Econ. Ent., 25 (1932), No. 2, pp. 174–187*).—The authors report that during the summer of 1931 the differential grasshopper and the two-striped grasshopper destroyed 75 per cent of the crops over an area 17,000 square miles in extent and 25 per cent of the crops over an additional 13,000 square miles. Commercially made poisoned bran mash gave good results. Airplanes were used successfully and economically in scattering grasshopper bait in cornfields. Maximum feeding on poisoned bran mash took place most commonly at air temperatures of from 75 to 85° F.

The effect of some gases on the tracheal ventilation of grasshoppers, E. R. MCGOVRAN (*Jour. Econ. Ent., 25 (1932), No. 2, pp. 271–276*).—It was found that carbon dioxide, carbon disulfide, hydrocyanic acid gas, and nicotine in certain concentrations increased the volume of air inhaled into the tracheal system by the respiratory movements of the grasshoppers that were studied.

The rôle of the airplane in grasshopper control, C. J. DRAKE and G. C. DECKER (*Jour. Econ. Ent., 25 (1932), No. 2, pp. 189–195, pls. 2*).—In this contribution from the Iowa Experiment Station the authors report that the airplane was used during July, August, and September to scatter 200,000 lbs. of poison bran mash to control grasshoppers in western Iowa, the mash being applied at the rate of 20 lbs. (10 lbs. of dry bait) to the acre.

Transmission of the pineapple yellow-spot virus by Thrips tabaci, M. B. LINFORD (*Phytopathology, 22 (1932), No. 4, pp. 301–324, figs. 8*).—In this contribution from the Hawaiian Pineapple Canners' Experiment Station details of the study previously noted (E. S. R., 65, p. 852) are given. "Larvae from a noninfective colony become infective after feeding upon a diseased plant, but adults treated similarly do not. The virus survives pupation, and insects that feed on a source of virus while larvae may be infective as adults. There is a period of approximately 10 days after first feeding on a diseased plant before thrips transmit infection. A single insect, larva or adult, may transmit the virus to Emilia. The minimum incubation period in *E. sagittata* is about 8 days and the mean about 15 days. In young pineapple plants the minimum is 7 days and the mean about 12 days. *T. tabaci* transmits the virus to and recovers it from several other plants in addition to pineapple and Emilia."

The Thysanoptera of Europe, III, IV, H. PRIESNER (*Die Thysanopteren Europas. Vienna: Fritz Wagner, 1927, pt. 3, pp. 343–568, pls. 2; 1928, pt. 4, pp. 569–755, figs. 8*).—In the third volume of this work (E. S. R., 56, p. 857), the superfamily Thripoidea of the suborder Terebrantia is continued and completed. The suborder Tubulifera is then taken up (pp. 473-704), and the superfamilies Phloeothripoidea (pp. 474-698) and Urothripoidea (pp. 698-700) are dealt with, the superfamily Phloeothripoidea being continued from volume 3 to volume 4. The work includes a 19-page list of references to the literature (pp. 726-744) and an index to genera and species.

Control of the apple capsid: An account of some field experiments during 1930, M. D. AUSTIN (*Jour. Min. Agr. [Gt. Brit.], 38 (1931), No. 2, pp. 154–162*).—Details are given of experimental work for control of the apple capsid (*Plesiocoris rugicollis* Fall.) in its egg stage, mention being made of various washes that have been used, including the Long Ashton washes, and the results obtained in experiments during 1930 (E. S. R., 64, p. 544).

A method of artificially feeding the sugar-beet leafhopper, J. M. Fife (*Science, 75 (1932), No. 1948, pp. 465, 466, figs. 2*).—The author describes a method which he has devised for artificially feeding the beet leafhopper and closely related species on very small amounts of solutions of known composition.

Injury to hollyhock and marigold by the potato leafhopper, Empoasca fabae (Harris), F. F. Smith (*Jour. Econ. Ent., 25 (1932), No. 2, pp. 318–321, pls. 2*).—The injury caused to hollyhock and African marigold by the potato leafhopper during the season of 1931 is described. In experiments conducted the symptoms were reproduced by the feeding of the pest on caged plants.

Spraying and dusting experiments for the control of leafhoppers infesting dahlias and asters, C. C. Hamilton (*Jour. Econ. Ent. 25 (1932), No. 2, pp. 304–311, figs. 6*).—In tests conducted at the New Jersey Experiment Stations during the summer of 1930 with pyrethrum sprays and dusts, nicotine sprays and dusts, white oil sprays of four viscosities, these same four white oils impregnated with copper oleate, a sulfonated oxidized oil, and Bordeaux sprays, all were effective in killing leafhoppers on asters and dahlias except the Bordeaux sprays. The Bordeaux sprays and the pyrethrum dusts were the only materials tested which acted as repellents to the leafhoppers. All the sprays were safe for the plants with repeated applications except the white oil sprays which, when used alone and impregnated with copper oleate, caused burning to the foliage of asters.

"Tests conducted during the summer of 1931 with pyrethrum sprays and dusts and Bordeaux sprays showed that heavy applications of Bordeaux sprays or of a pyrethrum dust applied dry or as a wet wash were effective in repelling the green apple leafhopper (*Empoasca mali*) for a period of four to five days. Nicotine dusts were of only slight value in repelling the leafhoppers. Six-ft. cheesecloth cages constructed around groups of plants supplemented with an occasional dusting with pyrethrum gave the best control of leafhoppers. The leafhopper population in the treated plats was reduced to zero at each treatment, but was built up almost to that of check plats within five days due to migration of the leafhoppers from outside sources."

Leafhopper response to colored lights, E. G. Kelsheimer (*Ohio Jour. Sci., 32 (1932), No. 2, pp. 85–94, pl. 1*).—In studies conducted at the Ohio Experiment Station and here reported, the details of which are given in tabular form, it was found that leafhoppers responded to lights so long as the humidity remained under 83 per cent, but when increased above that point they ceased coming, although those already at the lights remained there. It was found that a high temperature and low humidity are best suited to leafhopper response to light, but that a high humidity so long as it does not pass 83 per cent draws many leafhoppers. A combination of low temperature and high humidity is inimical to leafhopper attraction.

The beet leafhopper in northern Utah, G. F. Knowlton (*Utah Sta. Bul. 234 (1932), pp. 64, figs. 17*).—This report of a study of the beet leafhopper in northern Utah, conducted in cooperation with the U. S. D. A. Bureau of Entomology and presented in connection with a list of 233 references to the literature, deals with the leafhopper's history, general life history, northern Utah environment and distribution, host plant relationships, overwintering areas, the 1931 migration, insect association studies, biological control by parasites and predators, and sugar beet field studies, the data being presented in large part in tabular and chart form.

Collection data are said to indicate that three generations usually develop annually in this territory, the first generation in breeding grounds where suc-

cessful overwintering has taken place and the second and third on sugar beets, introduced annuals, or on any acceptable available host plant. The principal northern Utah breeding grounds lie in desert areas of Tooele and Box Elder Counties. Many recently developed breeding grounds, largely the result of favorable host plants growing up over thousands of acres of abandoned dry farms, are undoubtedly responsible for much of the increase in curly top damage to sugar beets suffered during recent years. Small populations of the beet leafhopper successfully pass the winter in the alfilaria foothills near Garland, Bothwell, Thatcher, Penrose, and Magna. An early movement of the dark overwintering females into the contiguous sugar beet fields results in early injury. This movement occurs previous to the larger, more widespread dispersal that follows the maturity of the first generation of leafhoppers in the large breeding areas.

The succession, condition, and abundance of the host plants in a given area where successful beet leafhopper overwintering occurs is especially important in determining the seasonal abundance of the beet leafhoppers in the area. When winter conditions permit survival and a suitable sequence of host plants is available during the entire season of beet leafhopper activity, the area may become a permanent breeding ground. Spring host plants of most importance in northern Utah breeding grounds are the mustards *Cheirinia repanda*, *Norta altissima*, *Sophia sophia*, and *Lepidium perfoliatum*, and alfilaria (*Erodium cicutarium*). The two most important summer host plants are Russian thistle (*Salsola pestifer*) and red scale (*Atriplex rosea*). The spring hosts listed above again become important as fall hosts, carrying the beet leafhopper until cold weather puts an end to activity.

Pipunculus and dryinid parasites of the adult and nymphal beet leafhopper occur in nearly all parts of northern Utah from which beet leafhoppers have been collected and examined. This predacious big-eyed bug *Geocoris decoratus* Uhler is present in large numbers on breeding grounds, in beet fields, and in most places where the beet leafhopper occurs. This bug readily attacks the leafhopper and apparently is responsible for killing large numbers during the course of the season. Cage tests showed the damsel bug *Nabis ferus* (L.) to be a voracious feeder upon the beet leafhopper. While more efficient per individual this species is less abundant in the breeding grounds and, compared with the big-eyed bug, may occupy a position of secondary importance as an agency of control. Two common lizards feed extensively upon the beet leafhopper, especially when the insect becomes extremely abundant in desert breeding grounds. During the seasons 1930 and 1931 the stomach contents of 710 lizards were examined, 374 containing 2,735 beet leafhoppers.

Report on spruce-aphis investigation for the year ending December, 1930, L. J. Dumbleton (*New Zeal. Jour. Sci. and Technol., 13 (1932), No. 4, pp. 207–220, figs. 12*).—A report is given of a study of the occurrence of *Neomyzaphis abietina* Walk., which has been the cause of a large loss of spruce in the Taranaki district of New Zealand. Mention is also made of the conifer spinning mite *Paratetranychus ununguis* Jacobi and of *Tortrix excessana* Walk. as enemies of spruce in New Zealand.

The control of the pea aphid in alfalfa fields, with special reference to the chain drag, R. C. Smith (*Jour. Econ. Ent., 25 (1932), No. 2, pp. 157–164, pl. 1*).—In this contribution from the Kansas Experiment Station the author summarizes the history of the pea aphid as an alfalfa pest in that State, the results of its attacks, and experiments on artificial control.

"Nicotine sulfate sprays and dusts, use of harrows, field roller, cultipacker, and the brush drag did not give satisfactory control. Burning, while a theo-

retically correct control, is difficult, expensive, and of doubtful value. The use of Cyanogas flakes broadcasted in or at the margins of spots at about 80 lbs. or more to the acre, and the aphids then jarred to the ground, has given excellent results. Two aphid dozers, an original one and one of Dr. Dudley's machines [E. S. R., 62, p. 649], were tested for four seasons. Collections of 30 to 90 per cent of the aphids have been made, depending on the height of the alfalfa.

"A new control implement, called a chain drag, has been devised. It has been used in only one outbreak where the infestation was reduced 50 or 60 per cent by one treatment. The drag is inexpensive to build and operate. It is regarded as a promising control implement for this insect and possibly for some other insect pests occurring in alfalfa fields."

Some notes on scale resistance and population density, H. Knight (*Jour. Ent. and Zool., 24 (1932), No. 1, p. 1*).—In studies conducted with coccids in California, where in certain citrus-growing sections resistant strains of some scale insects seem to have developed, it appears that resistance varies directly as the density of population. As a corollary, the kill varies inversely as the density of population.

Fauna of Lahore.—I, Butterflies of Lahore, D. R. Puri (*Bul. Dept. Zool., Panjab Univ., 1 (1931), pp. [2]+61, pls. [6]*).—The 167 specimens collected mainly in the summer of 1925 were found to represent 57 species and belong to 34 genera.

The effects of desiccation upon the growth and development of the Mediterranean flour-moth, B. R. Speicher (*Penn. Acad. Sci. Proc., 5 (1931–1932), pp. 79–82, fig. 1*).—The author has found a dry atmosphere and dry food to have an appreciable effect on the Mediterranean flour moth by diminishing the size and delaying pupation. Larvae so reared in dry atmosphere are inactive, apparently avoiding all movements involving loss of body moisture. Despite dry atmosphere, the larvae and pupae maintain a constant percentage of free water in the body as long as they survive.

The present status and future requirements of the gipsy moth problem, A. F. Burgess (*Jour. Econ. Ent., 25 (1932), No. 2, pp. 393–396*).—A brief review of the problem.

Biology and habits of the strawberry leaf roller, Ancylis comptana (Froel.), in New Jersey, D. E. Fink (*Jour. Agr. Research [U. S.], 44 (1932), No. 7, pp. 541–558, figs. 9*).—In a study of the life history of the strawberry leaf roller in New Jersey, the author has found from 20 to 120 eggs to be deposited by fertilized females, usually on the under surface of the leaves, the eggs hatching in from 5 to 17 days. Up to the time they are half grown the larvae feed on the under surface of the leaves, protected by silky retreats; they then migrate to the upper surface of the leaves, which they roll or fold, and within which they continue feeding and finally pupate. The summer generation larvae molt four times; the hibernating larvae may molt six or more times.

"The prepupal period in the summer generations lasts from 2 to 3 days, and in the hibernating generation it lasts throughout the winter. The pupal stage lasts from 6 to 13 days. The life cycle, or developmental period, of the summer generations averaged 51.4 days for the first generation and 37.9 days for the second, and that of the hibernating generation averaged 198.1 days. Hibernation takes place in the prepupal stage within the rolled or folded strawberry leaves lying on the surface of the ground. An increase in the accumulation of adipose tissue and a reduction of the water content of these larvae precede hibernation. Experiments indicate that when hibernating larvae are subjected

to a temperature of 24 or 31° C. for 4 days or more and are afterwards placed at a temperature of 10° for a considerable length of time a high mortality results. If kept first at a temperature of 10° for a considerable length of time and afterwards placed at a temperature of 24 or 31°, pupation occurs and the mortality is very low. Experiments with pupae indicate that the limits of pupal development are between 15 and 35°, with an optimum between 27 and 34°."

This leaf roller is attacked by more than a dozen species of parasites, of which *Macrocentrus ancylivora* (Roh.) is one of the most important, 60 per cent of the larvae collected during June and August having been found parasitized by it. Other important parasites include *Cremastus cookii* Davis, which parasitized 15 per cent of the larvae collected during June and August, *Spilocryptus exannulatus* Cush., which parasitized from 5 to 10 per cent of the larvae collected during the same period, a species of Perisierola, of the family Bethylidae, which parasitized only from 2 to 5 per cent of the larvae collected in June, and the tachinid fly *Exorista pyste* Walk., which parasitized 5 per cent.

Life history and habits of the three-lined leaf roller, Pandemis limitata Rob. in Nova Scotia, F. C. Gilliatt (*Sci. Agr., 12 (1932), No. 8, pp. 506–521, figs. 15*).—This is a report of studies of the biology of a leaf roller which first came to attention in a few orchards in the Annapolis Valley in Nova Scotia in 1926. The details are given in tabular form.

Life history of the grape-berry moth in Delaware, H. L. Dozier, L. L. Williams, and H. G. Butler (*Delaware Sta. Bul. 176 (1932) pp. 47, figs. 14*).—A study of the life history and bionomics of the grape berry moth, commenced on April 1, 1928, and continued until April, 1930, at the entomological station at Camden in the heart of the Delaware fruit belt, is reported upon, the details being given in 36 tables. Although known to have been present in the State for at least 20 years, it was not until the summer of 1926 that it began to cause noticeable losses.

It was determined that three generations of the grape berry moth develop annually in the State, a high percentage of the second brood pupae as well as all of those of the third brood wintering over. The average number of days required for the completion of the life cycle of the first brood from oviposition to emergence of the adult in 1929 was 34.4 days, with a maximum of 61 days and a minimum of 21 days; for completion of that of the second brood in 1928 it was 37.1 days, with a maximum of 68 days and a minimum of 22 days. In 1929 the period was somewhat shorter, the average being 34.7 days, with a maximum of 48 days and a minimum of 26 days. Emergence of the first-brood moths in 1928 occurred over the period from July 12 to August 11, with the peak between July 27 and August 3; in 1929 it occurred over a period from July 10 to August 15, the peak being between July 17 and 19. Emergence of the second-brood moths occurred in 1928 between August 20 and September 22, a period of 33 days, and in 1929 from August 18 to 31, the peak occurring between August 21 and 24. In 1929, 19.8 per cent of the second brood emerged and 80.2 per cent overwintered in the pupal stage; all of those that pupated the first 3 days emerged the same season.

In 1928 oviposition by the first-brood adults occurred from July 17 to August 19; oviposition by the second-brood adults occurred from August 26 to October 6. The first eggs of the season are usually deposited about the time that the Concord variety is in blossom, in 1929 it being on May 24. The length of the incubation period, from May 24 through July 10, averaged 4.3 days in 1929, with a maximum of 9 days and a minimum of 3 days. The length of the incubation period of the second-brood eggs in 1928, from July 17 to August 22,

inclusive, averaged 4 days, with a maximum of 6 days and a minimum of 3 days; in 1929 it extended from July 15 to September 3, inclusive, averaging 4.3 days with a maximum of 6 days and a minimum of 3 days. The length of incubation period of the third-brood eggs in 1928, from August 25 to October 16, averaged 7 days, with a maximum of 14 days and a minimum of 3 days, becoming longer as the season advanced and temperature became lower; in 1929 it extended from August 20 to September 15, averaging 4.8 days, with a maximum of 6 days and a minimum of 4 days.

In 1929 the feeding period of the first-brood larvae averaged 17.9 days, with a maximum of 36 days and a minimum of 9 days. In 1928 the feeding period of the second-brood larvae extended over a period of 62 days, from July 21 to September 20, a period averaging 20.3 days, with a maximum of 38 days and a minimum of 10 days. In 1928 the feeding period of the third-brood larvae extended over a period of 53 days, from August 29 to October 20, with an average of 26 days, a maximum of 45 days and a minimum of 17 days; in 1929 it extended over a period of 51 days, from August 26 to October 15, with an average of 24.3 days, a maximum of 40 days and a minimum of 13 days. The length of the entire period of activity in 1929 covered 173 days.

A list is given of 17 references to the literature.

Results of insecticide tests for the control of codling moth and observations on codling moth activity during the season of 1931 in the Yakima Valley, Washington, W. S. REGAN (*Berkeley: Calif. Spray-Chem. Corp., 1932, pp. 30, fig. 1*).—This is an account of further control work with the codling moth in the Yakima Valley of Washington (E. S. R., 65, p. 654), the details of spraying tests, codling moth bait pot collections, and banding records being given in tabular form.

Orchard spraying for the codling moth (*Nebraska Sta. Rpt. [1931], pp. 21, 22*).—A brief report is given (E. S. R., 65, p. 854).

The oriental fruit moth in New York, P. J. PARROTT (*Jour. Econ. Ent., 25 (1932), No. 2, pp. 355–360*).—In this contribution from the New York State Experiment Station, the importance of the oriental fruit moth to the peach industry of New York and the status of efforts with insecticides and parasites are briefly summarized. Since the outlook for a satisfactory control measure is considered none too promising, an appeal is made for a careful analysis of the present research program to determine the lines of attack which give most promise of a satisfactory solution.

Preliminary experiments with new spray materials against the oriental fruit moth, S. W. FROST (*Jour. Econ. Ent., 25 (1932), No. 2, pp. 381–385, pl. 1*).—In this contribution from the Pennsylvania Experiment Station, figures are presented which show some positive as well as negative results against the oriental fruit moth from the use of 1 per cent oil emulsions and sodium aluminum fluoride.

Effect of artificial illumination on the oriental fruit moth under orchard conditions, B. F. DRIGGERS and B. B. PEPPER (*Jour. Econ. Ent., 25 (1932), No. 2, pp. 385–392, pl. 1*).—This is a report of a study made by the New Jersey Experiment Stations on several varieties of peaches at New Brunswick and Moorestown, N. J., of the effect of light from ordinary electric light bulbs on egg deposition by the oriental fruit moth. "The lights were suspended above the trees in such a way that groups of trees received different degrees of illumination ranging from 0 to 10 or more foot candles. One tree in each of three tests was illuminated from above and below so that all parts of the tree received illumination of an intensity of 10 foot candles or more. The lights were burned nightly or at such times as the moths showed activity. A photo-electric relay

and thermostat was used to switch the lights on and off at the desired light intensity and temperature in the orchard. The effect of the lights on egg deposition was measured by counting the number of injured twigs caused by first and second brood larvae and by the percentage of injured fruit at harvest. No repellency of the moths was noted in any of the tests. No pronounced attraction of the moths by the light was evident either."

The infestation of young okra pods by pink bollworm in Porto Rico, G. N. WOLCOTT (*Jour. Dept. Agr. Puerto Rico, 15 (1931), No. 4, pp. 395–398*).—The infestation of tender young okra pods not more than 3 in. long nor more than 3 days old is said to occur in Puerto Rico when the okra plants are close to cotton fields maturing bolls which are heavily or totally infested by the pink bollworm.

Summary of work on the pink bollworm, U. C. LOFTIN (*Virgin Islands Sta. Rpt. 1931, pp. 19, 20, figs. 2*).—A study made of the pink bollworm at St. Croix, where it and the low price paid have been responsible for the abandoning of the growing of sea island cotton, resulted in the finding of it in large numbers on wild cotton and other host plants. It was found to be widely scattered over the entire wild cotton area, only a few estates on the island being free from it. It was rather commonly observed in okra, and a slight infestation was found in otaheite (*Thespesia populnea*) and in *Hibiscus vitifolius*. It is pointed out that okra is the favorite vegetable of the natives and is grown in every garden. *T. populnea* grows very abundantly along the seashore on the northern and western coasts and is frequently seen in dooryards, and *H. vitifolius* is a common weed along roadsides and in pastures.

The wide distribution of its wild host plants and the danger of its reintroduction from other islands led to the decision not to attempt its eradication in St. Croix but to clean up the wild cotton, its most important host, and adopt a 2-year or 3-year closed season before planting cotton again. About half of the island had been cleared of wild cotton by September 1. Control was not attempted on the islands of St. Thomas and St. John, due to the small area of cultivated land and the close proximity to other infested islands.

Borkhausenia pseudospretella and other house moths, F. LAING (*Ent. Mo. Mag., 3. ser., 18 (1932), No. 208, pp. 77–80*).—An account is given of the habits of *B. pseudospretella*, the larva of which has a varied diet, being not uncommon in granaries and grain warehouses in England, where it feeds particularly on the chaff. It has been referred to as the false clothes moth and the scavenger bulb moth. Its development may take place from about 41 weeks, or 291 days, to 16 or 17 months, but the average would appear to be from 11 to 13 months. The adult may emerge during any month of the year, and the larvae go on feeding actively throughout the winter.

Scientific survey of Porto Rico and the Virgin Islands.—Vol. XII, pt. 1, Insects of Porto Rico and the Virgin Islands: Heterocera or moths (excepting the Noctuidae, Geometridae, and Pyralididae), W. T. M. FORBES (*New York: N. Y. Acad. Sci., 1930, pp. 171, pls. 2, figs. 17*).—The introduction to this contribution (E. S. R., 62, p. 546) takes up the geology and origin of the fauna, examples of Puerto Rico butterflies endemic in the West Indies, distribution in Puerto Rico, and diagnosis of the Lepidoptera, and includes a key to the families. A systematic account of the species (pp. 19–168) includes keys to the genera of the several families, synonymy of the forms recognized, and notes with records of their occurrence. Several species are described as new to science. A bibliography of three pages is included.

Supplementary report on the Heterocera or moths of Porto Rico, W. T. M. FORBES (*Jour. Dept. Agr. Puerto Rico, 15 (1931), No. 4, pp. 339–394, pls.*

6).—This report is an appendix to the revision of certain families of moths in the account noted above, and is based primarily upon material in those families collected by the author in 1930, 4 genera being erected and 37 species described as new.

Airplane oiling to control mosquitoes, J. M. Ginsburg (*Science, 75 (1932), No. 1951, pp. 542*).—In an experimental application by the New Jersey Experiment Stations of oil for control of mosquitoes, an airplane was equipped with the necessary apparatus, including two tanks of about 50 gal. capacity each, installed in the forward cockpit of the plane and connected to a steel pipe 3 in. in diameter. This pipe was extended along the bottom of the fuselage throughout the length of the plane, terminating just below the rudder in a cross pipe 7 ft. long and 1½ in. in diameter, this horizontal pipe being perforated with holes ranging from ⅛ to ¼ in. in diameter and serving the purpose of a nozzle from which the liquid flows out.

The results thus far obtained through application in this way of both pyrethrum larvicide and oil have shown that on a still day when there is no appreciable wind to blow away the larvicide from its course a killing film of oil or larvicide is deposited on the surface of the breeding area. In two experiments carried out on a salt marsh meadow and on an upland meadow, practically complete kill of larvae and pupae was obtained in each case. About 8 acres of the upland meadow were covered with a killing film of oil in about 40 minutes, about 140 gal. having been applied. The cost, as estimated by several experienced field men, was found to be less than for hand oiling.

The action of colloidal Paris green on the larvae of Culex apicalis.—A preliminary report, H. G. Grant, B. M. Newman, and P. D. Wood (*Pub. Health Rpts. [U. S.], 47 (1932), No. 23, pp. 1239–1247*).—The authors found that under laboratory conditions colloidal Paris green is toxic to the larvae of *C. apicalis* in as small concentrations as 1 part by weight of Paris green to 5,000,000 parts by weight of water. Colloidal preparations made from a solution of Paris green in concentrated NH_4OH gave the best results of any of the preparations used, killing all larvae placed in 1 to 5,000,000 dilutions within periods ranging from 19 hours to 3 days. It is considered possible that colloidal Paris green can be developed as an effective and comparatively inexpensive mosquito larvicide.

Relation of shelter to abundance of pear midge, F. Z. Hartzell (*Jour. Econ. Ent., 25 (1932), No. 2, pp. 351–355*).—At the New York State Experiment Station infestation by the pear midge was found to vary inversely with the distance from the source of shelter. Data and analyses of orchard environment are given upon which the fact is believed to be established.

The Tabanidae (horseflies) of Minnesota with special reference to their biologies and taxonomy, C. B. Philip (*Minnesota Sta. Tech. Bul. 80 (1931), pp. 132, figs. 22*).—In part 1 of this contribution (pp. 3–77) an introduction takes up the history, economic status, and disease transmission, while the biological discussion considers the representative life history, early stages of other species, bionomics of adults, seasonal and geographic distribution, climate and topography of the State, environmental resistance and tabanid population, and preventive and protective measures. A four-page list of references to the literature cited is included. Part 2 (pp. 77–132) consists of a systematic treatise, including the taxonomy of adults, keys to immature stages, and a summary, followed by a list of taxonomic references, 21 in number. The author finds three genera, namely, Chrysops, Haematopota, and Tabanus, represented respectively by 18, 1, and 28, or a total of 47 species, known definitely to occur in the State. In addition, the genera Silvius and Buplex, with

1 species each, are treated on the strength of their occurrence in adjacent States. The species *T. dawsoni*, *T. fulvicallus*, and *T. longiglossus* are described as new.

It is pointed out that "only a few species of the robust horseflies of the genus Tabanus and of the smaller pictured-winged deer flies of Chrysops occur in abundance enough to be considered pests. . . . Observations on the bionomical activities of the adult flies, their habits, seasonal and geographic distribution, and on the immature stages of certain species in Minnesota are recorded. *T. lasiophthalmus*, a troublesome species of some abundance particularly in the muskeg sections of the north, was reared from field-collected eggs and found to have nine larval instars from the time of hatching in June to pupation in the following spring, under laboratory conditions. It appears probable that most species have one generation a year under these climatic conditions. Hibernation is accomplished in the larval stage. Other species reared from larvae or pupae taken in the field were *T. epistates*, *T. illotus*, *T. lineola*, *T. nivosus*, *T. reinwardtii*, *T. stygius*, *T. trimaculatus*, *C. aestuans*, *C. callidus*, *C. carbonarius*, *C. excitans*, *C. indus*, *C. mitis*, *C. montanus*, *C. wiedemanni*, *C. sackeni*, and *C. striatus*. . . .

"The physical factors of the environmental resistance are discussed, and it is considered likely that the rigors of winter do not kill many larvae during hibernation. Of the biotic factors, the cannibalistic nature of Tabanus larvae appears to be of potential importance in reducing the numbers of tabanids before pupation. Three hymenopterous parasites were reared from eggs, *Phanurus emersoni* from both Tabanus and Chrysops eggs, and *Trichogramma minutum* and *Anaphoidea* sp. from those of Chrysops. A new species of tachinid fly was reared from Tabanus larvae, and the hymenopteran *Diglochis occidentalis* was reared from pupae of *C. mitis*. Nematodes were found attacking larvae and pupae of several species, and in one instance an adult of *T. metabolus*, all taken in the field."

The chemical treatment of baits for attracting blowflies, I, M. R. Freney (*Jour. Council Sci. and Indus. Research* [Aust.], *5* (*1932*), *No. 2, pp. 94–97, fig. 1*).—The first of two experiments reported showed that (1) the period of attractiveness of the sodium sulfide treated bait was much longer than that of the untreated bait, (2) the sulfide treated bait was more attractive to all species of blowflies than the untreated bait, and (3) the increased attractiveness due to treatment was somewhat greater for secondary flies than for primary flies. The second experiment showed that (1) the period of effective attractiveness of the sodium sulfide treated bait was much longer than that of the untreated bait, the former catching 15,000 flies and the latter 300 flies between the fourth and twenty-fourth days of the experiment; (2) the untreated bait was much less attractive than either fresh liver or the treated blowfly soup; (3) the treated bait was as attractive for primary flies, and more than twice as attractive for secondary flies, as the fresh liver during the first 8-day period; (4) the total effectiveness of the treated bait was 19 times that of the untreated bait; and (5) treatment increased the attractiveness of the bait for all blowflies, but more for secondaries than for primaries.

Sheep blowfly investigations: Experiments on artificial baits—preliminary note on the products of decomposition of wool fibre (keratin), M. R. Freney (*Jour. Council Sci. and Indus. Research* [Aust.], *5* (*1932*), *No. 1, pp. 28–30*).—The author has found that keratin from wool fiber when decomposed by sodium sulfide solution is attractive to flies, a higher proportion of females (about 98 per cent) being caught by this bait than is caught by a carrion bait. A solution containing decomposed keratin is more attractive to primary than to secondary blowflies.

Fly sprays for dairy cows.—A progress report, S. B. Freeborn and W. M. Regan (*Jour. Econ. Ent., 25 (1932), No. 2, pp. 167–174, fig. 1*).—The authors present a progress report on tests of the efficiency of fly sprays (E. S. R., 59, p. 760) of petroleum oils carrying pyrethrum, pine oil, or both, designed to keep flies from dairy cows.

"It was shown that all had approximately the same efficiency for the first hour but differed at subsequent intervals, pine oil increasing their efficiency in proportion to the amount applied. Burning followed the use of oils having a viscosity lower than 40 seconds irrespective of the unsulfonated residue, while oils with unsulfonated residues below 90 per cent were dangerous if used in oils of higher than 65 seconds viscosity. The pyrexial point, defined as the environmental temperature above which cows could not maintain a normal body temperature, was determined for the experimental animals. The application of oil sprays lowered this pyrexial point approximately 5° by impairing the small amount of cooling that takes place through the action at the surface of the skin. The different sprays varied in their effects on this pyrexial point."

The buffalo-fly in Australia, R. J. Tillyard (*Jour. Council Sci. and Indus. Research [Aust.], 4 (1931), No. 4, pp. 234–243*).—A summary of information on the importance, biology, and control of *Lyperosia exigua* De Meijere in Australia is presented, with a bibliography of 34 titles.

The control of Noogoora and Bathurst burr by insects, S. G. Kelly (*Jour. Council Sci. and Indus. Research [Aust.], 4 (1931), No. 3, pp. 161–172*).—This is a preliminary account of work under way in Kansas with a view to finding insect enemies of the cocklebur (*Xanthium* spp.) to introduce into Australia. A brief introduction is followed by a review of the literature of nine insect enemies, a discussion of the methods employed, and a report of studies in 1929 and 1930 of the trypetid *Euaresta aequalis* Loew, whose maggots feed in the seeds, and eight other forms. A list is given of 25 references to the literature.

A new species of two-winged fly belonging to the genus Acronarista (Diptera: Tachinidae), H. J. Reinhard (*Ent. News, 42 (1931), No. 1, pp. 26, 27; abs. in Texas Sta. Circ. 61 (1931), p. 18*).—A new tachinid from Opelousas, La., is described as *A. cornuta*.

Revision of the American parasitic flies belonging to the genus Winthemia, H. J. Reinhard (*U. S. Natl. Mus. Proc., 79 (1931), Art. 20, pp. 54, pl. 1; abs. in Texas Sta. Circ. 61 (1931), pp. 22, 23*).—In this contribution 32 American species of Winthemia are recognized, of which 16 are described as new to science.

The two-winged flies belonging to Siphosturmia and allied genera, with descriptions of two new species, H. J. Reinhard (*U. S. Natl. Mus. Proc., 79 (1931), Art. 11, pp. 11; abs. in Texas Sta. Circ. 61 (1931), p. 21*).—In this contribution seven species representing the genera Microsillus, Siphosturmia, and Siphosturmiopsis are described, of which two are new to science, namely, *Siphosturmia confusa* and *Siphosturmiopsis melampyga*.

The control of ked (tick) in sheep, M. Henry (*N. S. Wales Dept. Agr., Sci. Bul. 38 (1931), pp. 28*).—Part 1 of this contribution consists of a general discussion (pp. 1–5) and part 2 of observations in different districts in New South Wales (pp. 6–13). Part 3, by H. R. Seddon and C. Blumer, reports on investigations into the control of the sheep tick (pp. 14–27).

Dispersal of the sticktight flea of hens (Echidnophaga gallinacea Westw.), M. A. Stewart (*Jour. Econ. Ent., 25 (1932), No. 2, pp. 164–167*).—This is an account of the animals which may serve as dispersal agents of the

sticktight flea of hens in North America and the hosts and distribution of this flea in the United States.

The experimental transmission of endemic typhus fever of the United States by the rat flea, Ceratophyllus fasciatus, R. E. Dyer, W. G. Workman, L. F. Badger, and A. Rumreich (*Pub. Health Rpts.* [*U. S.*], *47* (*1932*), *No. 17, pp. 931, 932*).—The authors report that the experimental transmission of the virus of endemic typhus from rat to rat by means of the rat flea has been carried out in the laboratory.

Typhus fever: The multiplication of the virus of endemic typhus in the rat flea, Xenopsylla cheopis, R. E. Dyer, W. G. Workman, E. T. Ceder, L. F. Badger, and A. Rumreich (*Pub. Health Rpts.* [*U. S.*], *47* (*1932*), *No. 18, pp. 987–994*).—The authors have found that the endemic typhus virus multiplies enormously in the oriental rat flea.

A comparison of the alimentary canals of the active and hibernating adults of the Mexican bean beetle, Epilachna corrupta Muls., E. D. Burgess (*Ohio Jour. Sci.*, *32* (*1932*), *No. 3, pp. 249–261, figs. 21*).—In this contribution the author has attempted to describe some of the histological differences in the active and hibernating adults.

The effects of temperature and moisture on the eggs of Epilachna corrupta Mulsant (Coccinellidae, Coleoptera), L. Pyenson and H. L. Sweetman (*Bul. Brooklyn Ent. Soc.*, *26* (*1931*), *No. 5, pp. 221–226*).—The authors find that "the eggs of the Mexican bean beetle hatch best in an environment of about 22° C. and 75 per cent relative humidity. The minimum effective temperature is near 13.5° and the maximum effective temperature near 30°. The best humidity is near 75 to 80 per cent. Low humidities below about 55 per cent are very unfavorable in all temperature conditions. High humidities of 95 to 100 per cent are unfavorable except near the optimum temperature."

Short rotation fails to prevent attack of Diabrotica longicornis Say, J. H. Bigger (*Jour. Econ. Ent.*, *25* (*1932*), *No. 2, pp. 196–199, figs. 3*).—In an experimental field at Carthage, Ill., a three-year rotation of corn, corn, and oats and sweetclover under way since 1928 did not control the corn rootworm, and the rotation was abandoned because of serious rootworm damage.

A preliminary report on the control of white grubs with a rotary plow, C. J. Drake, B. V. Travis, and E. V. Collins (*Jour. Econ. Ent.*, *25* (*1932*), *No. 2, pp. 199–206, pls. 2, figs. 4*).—In mechanical experiments by the Iowa Experiment Station for the control of white grubs (*Phyllophaga* spp.) by means of a rotary plow, conducted in virgin bluegrass pasture, timothy sod, and old corn stubble in the southern part of the State, 96.7 per cent of the grubs were killed during the plowing operation. The average population in a virgin 88-acre bluegrass pasture was 181,865 grubs to the acre, the most heavily infested spot yielding 223,245 grubs per acre. In transformation and hibernation studies it was found that only 4 per cent of the *Phyllophaga* spp. were within plow depth during the pupal and adult stages.

The distribution of the Japanese beetle in 1930 and 1931, with special reference to the area of continuous infestation, H. Fox (*Jour. Econ. Ent.*, *25* (*1932*), *No. 2, pp. 396–407, figs. 2*).—This account includes maps which show the area of continuous distribution in 1930 and 1931 and indicating the varying degrees of infestation within its limits.

Is the flight of the Japanese beetle necessarily restricted to a few months of the year? G. B. Stichter (*Penn. Acad. Sci. Proc.*, *5* (*1931–1932*), *pp. 40–42*).—A brief discussion of the subject.

Traps for the Asiatic garden beetle, H. C. Hallock (*Jour. Econ. Ent.*, *25* (*1932*), *No. 2, pp. 407–411, pls. 2*).—Light traps and the geraniol trap are dis-

cussed in relation to *Autoserica castanea* Arr. The geraniol trap has not proved successful. The history of the light trap is given, from the first one which caught 217 beetles in a season to another which caught 21,000 beetles in a single favorable night. Such factors as wattage, kind of light, color of trap, shading of objects near trap, and temperature are discussed.

Potato flea-beetles in Washington (Epitrix cucumeris Harris, Epitrix subcrinita Leconte), R. L. WEBSTER, W. W. BAKER, and A. J. HANSON (*Washington Col. Sta. Bul. 261 (1932), pp. 20, figs. 12*).—This is a report of studies made largely in western Washington, where in five counties during the past six years the potato flea beetle has been the source of serious losses to potato growers. While both the potato flea beetle and *E. subcrinita* occur commonly in western Washington, the severe injury to tubers is caused only by the common potato flea beetle of the Eastern States. In eastern Washington only *E. subcrinita* has been collected in potato fields. While the greatest injury is that caused by the larvae to the tubers, damage to foliage is often severe, especially following the emergence of the summer brood of beetles late in July or August. The studies indicate that the larvae of *E. subcrinita*, the western species of flea beetle, feed mostly on the roots of the potato plant rather than on the tubers. In many instances, growers in the infested district of these five counties have been unable to produce a crop of salable potatoes either for seed or for table use. Early planted potatoes suffer most injury in western Washington, the severe damage to tubers being done during July. In eastern Washington very little tuber injury has been observed, although damage to foliage has occurred.

Contact sprays or dusts have not been found satisfactory in checking the pest. "Sodium fluosilicate dust one part, lime three parts, applied at 10-day intervals throughout the season gave the most protection to foliage and tubers, but it was accompanied by slight injury to foliage. Barium fluosilicate dust (Dutox) one part, lime three parts, gave protection almost as satisfactory, without being accompanied by foliage injury. This treatment is recommended to potato growers who desire to utilize an insecticide to reduce flea beetle damage." The author suggests that in western Washington it may be necessary to delay planting until the latter half of June in order to avoid damage to tubers.

Rearing the rough-headed corn stalk-beetle, W. J. BAERG and C. E. PALM (*Jour. Econ. Ent., 25 (1932), No. 2, pp. 207–212*).—Under certain conditions in Arkansas, where the sugarcane beetle is a local pest, the stand of corn is destroyed in numerous localities scattered over a large part of the State. The life history studies reported in this paper deal with the preparation of food materials and give the duration of the various developmental stages.

The influence of humidity on the effectiveness of certain fumigants against the eggs and adults of Tribolium confusum Duv., D. L. LINDGREN and H. H. SHEPARD (*Jour. Econ. Ent., 25 (1932), No. 2, pp. 248–253, fig. 1*).—In studies at the Minnesota Experiment Station, ethylene oxide, carbon disulfide, and chloropicrin were investigated with respect to their toxicity to eggs and adults of the confused flour beetle. It was found that toxicity to adults is not affected by ordinary variations in relative humidity. "On the other hand, dry air conditions reduce materially the effect of chloropicrin and carbon disulfide on eggs. Under all moisture conditions tested, ethylene oxide was more effective against the eggs of Tribolium, whereas carbon disulfide and chloropicrin were more so against the adults. Contrary to the generally accepted view that the egg is a particularly resistant stage, ethylene oxide appears to be nine times as toxic to the eggs as to the adults of Tribolium."

Studies in population physiology: The relation of numbers to initial population growth in the flour beetle Tribolium confusum Duval, T. PARK (*Ecology, 13 (1932), No. 2, pp. 172–181, figs. 2*).—The details of the study of of the confused flour beetle here reported are presented largely in tabular form.

An experimental study of the growth of populations of the "flour beetle," Tribolium confusum Duval, as affected by atmospheric moisture, F. G. HOLDAWAY (*Ecol. Monog., 2 (1932), No. 3, pp. 261–304, figs. 11*).—This is a report of studies made at Canberra, Australia. Following an introduction, the subject is dealt with under the headings of growth phenomena in general, the effect of atmospheric moisture on the growth of Tribolium populations, an analysis of the effects of humidity on the components of a population, and the effect of humidity on Tribolium from the point of view of its effect on a population.

It was found that at the moisture conditions under which studies were made (25, 50, and 75 per cent relative humidity), there is an increase in the magnitude of the population possible as the relative humidity increases from 25 to 75 per cent. As conditions approach saturation, the magnitude falls to zero, population growth in such conditions being impossible owing to the development of fungi.

A five-page list of references to the literature is included.

On the pear-bark miner, Acrocercops astaurota Meyrick.—II, C. HARUKAWA and S. KUMASHIRO (*Ber. Ōhara Inst. Landw. Forsch., 5 (1932), No. 2, pp. 301–310, fig. 1*).—This is a report of studies of the biology and present means of control of *A. astaurota* in Japan, conducted in continuation of the work previously noted (E. S. R., 64, p. 461).

Pine oils as agents for protecting rustic furniture and log cabins from various wood borers, F. M. THOMPSON, JR. (*Jour. Econ. Ent., 25 (1932), No. 2, pp. 347–351*).—In work at the New Jersey Experiment Stations certain combinations of pine oils when sprayed on the bark of rustic furniture and log cabins were found very efficient in killing the larvae of *Hylotrupes ligneus* Fab., *Oeme rigida* Say, and *Callidium antennatum* Newm., or longhorned wood borers working in the wood. Further infestation of the wood was prevented for a period of at least one summer season following treatment, with no appreciable effect on the color of the bark.

A new mermithid-worm parasitic in the rice borer, with notes on its life history and habits, T. KABURAKI and S. IMAMURA (*Imp. Acad. [Japan], Proc., 8 (1932), No. 3, pp. 109–112, figs. 6*).—Under the name *Amphimermis zuimushi* n. g. and sp. the authors describe a nematode which apears to play an important rôle in the control of the Asiatic rice borer, examination having shown 76.22 per cent to be attacked by it.

The rice water weevil problem in Arkansas, D. ISELY and H. H. SCHWARDT (*Jour. Econ. Ent., 25 (1932), No. 2, pp. 218–222*).—A general discussion of this pest in Arkansas, in which it is pointed out that the loss caused by it may be reduced by drainage at the time the majority of the larvae have entered the third instar and before severe root pruning begins. The drainage should be continued until the soil is thoroughly dry.

The parsley and carrot weevil, Listronotus latiusculus Boheman, L. L. BUCHANAN (*Bul. Brooklyn Ent. Soc., 27 (1932), No. 1, pp. 7, 8*).—A study made of some 175 specimens, part of which were identified as *L. latiusculus* and part as *L. rudipennis*, indicates that there is but a single widely distributed species of carrot weevil, namely, *L. latiusculus*.

Abundance of the boll weevil in relation to summer weather and to food, D. ISELY (*Arkansas Sta. Bul. 271 (1932), pp. 34, figs. 7*).—The remark-

able variation in abundance and injuriousness of the cotton boll weevil from year to year in Arkansas led to the investigations of 1927, 1929, 1930, and 1931 here reported, presented in connection with a list of 57 references to the literature. The subject is dealt with under the headings of seasonal and life history; rearing methods; temperature, humidity, food, and the rate of development; summer weather and mortality of immature stages; temperature and reproduction; and food and reproduction.

In the study of the effect of temperature it was found that an increase from 69.8 to 87.8° F. reduced by one-half the time required for the life cycle. An increase from 26 to 31° C. (78.8 to 87.8° F.) shortens the period of development about 20 per cent. After cotton begins fruiting there are occasionally variations in temperature for a few days which accelerate or retard the life cycle. While these variations are never enough to change the number of generations occurring during the critical period of cotton production, they do affect the time of maturity of the first and second generations. It is pointed out that there is only a narrow range of temperature, or from 73.4 to 84.2° F., in which boll weevils can survive in large numbers. The optimum temperature appears to be from 75.2 to 77°. High temperature, unless accompanied by a low relative humidity, seldom continues for long enough periods in Arkansas to cause a high mortality of the immature stages, the summer of 1930 having been the only exception to this rule for the past 10 years. The soil, however, often becomes so hot that the stages in fallen squares may be killed soon after coming in contact with it. The relation of high air temperatures to outbreaks of the boll weevil is probably most significant in its stimulating effect upon reproduction. A rise in temperature from 77 to 84.2° may result in an increase of about 70 per cent in the number of eggs deposited, while a decline in temperature from 77 to 71.6° may result in a reduction of about 50 per cent.

An increase in relative humidity from 50 to 90 per cent consistently hastens development. In the field the relation of relative humidity to the rate of development is overshadowed to such an extent by the effect of temperature that its importance is not readily recognized. Relative humidity during the summer is the most important factor relating to the survival of immature weevils. According to the records, the survival of immature stages in squares is negligible at a relative humidity of 50 per cent and is near optimum at a relative humidity of 90 per cent. In the field, relative humidity is probably never so high as to be unfavorable, but it is often low enough to be distinctly unfavorable. A summer drought, therefore, is the most frequent cause for the failure of potential outbreaks of the boll weevil to materialize.

The boll weevil develops more rapidly in squares than in bolls, and also more rapidly in small bolls than in large ones. The conditions favorable to its most rapid development include a comparatively high temperature (from 77 to 84.2°), a high relative humidity of above 80 per cent, and an abundance of squares for food.

Immature stages of Indian Coleoptera (7–10), J. C. M. Gardner (*Indian Forest Rec., 14 (1930), No. 13, pp. 279–286, pls. 3; 16 (1931), No. 3, pp. 162–202 [49–89], pls. 3, No. 4, pp. 91–111, pls. 5; 16 (1932), No. 11, pp. 327–334, pl. 1*).—This is a continuation of the contributions previously noted (E. S. R., 63, p. 358). Part 7 deals with the Cicindelidae, Buprestidae, Melasidae, Elateridae, Tenebrionidae, and Cerambycidae; part 8 is a continuation of the Cerambycidae; part 9 deals with the Carabidae, Ostomidae, Endomychidae, Melyridae, Tenebrionidae, Othniidae, Oedemeridae, Languriidae, and Cerambycidae; and part 10 with the Anthribidae.

Brood area and colony size as factors in activity of pollination units, R. S. Filmer (*Jour. Econ. Ent., 25 (1932), No. 2, pp. 336–343*).—Studies at the

New Jersey Experiment Stations of package bees as pollinators show that brood area is a more important factor in activity than colony size where packages are established a relatively short time before the blooming period.

The comparative value of different colonies of bees in pollination, A. W. Woodrow (*Jour. Econ. Ent., 25 (1932), No. 2, pp. 331–336*).—In work at Ithaca, N. Y., strong colonies of bees were found to be superior to weak ones for pollination and established colonies to be superior to package bees of the same strength. Strong colonies were found to fly at lower temperatures than did weak ones.

The development of package-bee colonies, W. J. Nolan (*U. S. Dept. Agr., Tech. Bul. 309 (1932), pp. 44, figs. 6*).—This is a report of work commenced in 1926 with the package bee, which has brought many problems of apiary management.

The study has shown that under good conditions package bees can easily stand 2 to 3 days' shipment. They should be allowed from 8 to 9 weeks in which to build up, and, if small, even longer. In the experiment conducted no particular difference could be detected in the condition on the arrival of those packages shipped with queen bees and those shipped without them, nor was there any difference in the time elapsing before the queen bees in the two cases began to lay. Over half the queen bees commenced laying within 24 to 48 hours after the bees had been given access to the candy in the queen cage. A prolific queen was found to be highly essential for the optimum development of the package.

"The proper age for bees in the package depends on the use to which they are to be put. If the packages are to develop into colonies or are to help weaker colonies develop, the bees should be young enough physiologically to engage actively in brood-rearing activities. If the bees are to be used directly as pollinizers or nectar gatherers, they should be just entering field age. In any case they should be young enough physiologically to insure their proper functioning in the desired activity.

"Under proper conditions bees from packages will gather pollen within a few hours after being installed. This fact makes possible the use of the original bees in the package as pollinizers without the necessity of having them build up into colonies. The original bees in certain of the packages gathered nectar. This at least indicates the feasibility of securing a larger honey crop by reinforcing weakened colonies just before the honey flow with bees of the proper physiological ages both to gather and to store nectar. A package colony with even 21,000 field bees, under the optimum conditions prevailing in certain localities and with long seasons for nectar gathering, can store a satisfactory quantity of honey."

A list is given of 41 references to the literature.

The relation of the ant, Pogonomyrmex occidentalis Cr., to its habitat, A. C. Cole, Jr. (*Ohio Jour. Sci., 32 (1932), No. 2, pp. 133–146, figs. 6*).—This deals with the subject under the headings of geographical distribution, structure of the mound, the denuded area, observations in the Twin Falls, Idaho, area, harvesting habits, and compound nests. The list of seed harvested includes 29 species.

The witchery of wasps, E. G. Reinhard (*New York and London: Century Co., 1929, pp. XXI+291, pls. 16, figs. 13*).—This account of observations of the habits of solitary wasps includes a foreword by L. O. Howard.

The population of a nest of the hornet Vespa maculata, B. J. Betz (*Quart. Rev. Biol., 7 (1932), No. 2, pp. 197–209, figs. 4*).—The author reviews the literature on the nest population in the Vespidae and reports upon an

observation of the population of a large nest of the bald-faced hornet obtained in Baltimore County, Md., on October 22, 1930. This nest contained five combs of cells, the individual cells numbering 3,195. There was a population of 402 individuals. In the pupal stage, the number of males exceeded the number of females. In the adult population, queens and drones exceeded the workers in number. The immature hornets were found chiefly in the cells of the first combs. Four foreign insects were found in the nest which, it is presumed, were accidental invaders or were carried in as prey.

A list is given of 35 references to the literature.

Biology of some Japanese and Chosenese grub parasites (Scoliidae), C. P. Clausen, T. R. Gardner, and K. Sato (*U. S. Dept. Agr., Tech. Bul. 308* (*1932*), *pp. 27, figs. 8*).—This is a report of observations of the habits of the family Scoliidae made in Japan and Chosen in the course of investigations of the natural enemies of the Japanese beetle in the Far East during the period from 1920 to 1928, inclusive.

Of the 17 species treated 15 represent the genus Tiphia and 1 each the genera Scolia and Campsomeris. Several of these species occur also in China, where they were studied by H. A. Jaynes from 1924 to 1926, inclusive. The principal subjects dealt with in this comparative study are the host relationships, life cycle, feeding habits of adults, position and manner of placement of the egg upon the host body, and the type of cocoon. Notes are also given upon such of the natural enemies of the family as have been encountered. The food substances required by the adults were found to come from three general sources, (1) the secretions of aphids, scales, and various other Homoptera, (2) certain plant blossoms, and (3) nectar from various glands associated with foliage. The dispersion of the parasite can therefore follow that of the host only so far as the range of its particular food supply extends. The paralysis caused in the host was found to be permanent in the case of Scolia, Campsomeris, Dielis, and Elis, and only temporary in Tiphia. In the first four of these genera, the host grub is usually buried more deeply in the soil than its natural feeding level.

Natural enemies of the Scoliidae include a sphecid wasp, *Palarus saishiuensis* Okam. studied in Chosen, which stores its nests with adult Tiphia and certain other wasps of similar size, and two species of Mutilla and one of Perilampus reared from cocoons of Tiphia in India, though in very small numbers. The rhipiphorid beetle *Macrosiagon pusillum* Gerst. was found quite frequently in the cocoons of *T. pullivora* A. and J. in India. Four species of bombyliid flies are listed as having been reared from the cocoons of either Scolia, Campsomeris, or Tiphia in India. *Hyperalonia oenomaus* Rond. is the only one of these occurring in large numbers, and each year it parasitized from 50 to 65 per cent of the overwintering cocoons of an undetermined species of Tiphia. The nematode *Eomermis tenuissima* Cobb was reared occasionally during the summer from cocoons of *T. pullivora* and *T. matura* A. and J.

A list is given of 14 references to the literature cited.

Present status of oriental fruit moth parasite investigations, H. W. Allen (*Jour. Econ. Ent., 25* (*1932*), *No. 2, pp. 360–367*).—This contribution calls attention to certain possibilities both in the matter of importing foreign species and work with indigenous species, together with a review of the work which has been done with parasites of the oriental fruit moth.

Oriental fruit moth parasites in Maryland, H. S. McConnell (*Jour. Econ. Ent., 25* (*1932*), *No. 2, pp. 367–370*).—This contribution from the Maryland Experiment Station lists the parasites of the oriental fruit moth recorded in Maryland, with notes on their relative importance and distribution.

The biology and morphology of the braconid Chelonus annulipes Wesm., a parasite of the European corn borer, A. M. Vance (*U. S. Dept.

Agr., Tech. Bul. 294 (1932), pp. 48, pl. 1, figs. 12).—The braconid parasite *C. annulipes*, 1 of 6 species of Braconidae among the 30 or more known parasites of the European corn borer in Europe, was first discovered as a parasite of this pest in corn at Piacenza, Italy, in 1925. It has since been found to be of economic importance over a somewhat restricted area near St. Giorgio di Nogaro and in the environs of Piove di Sacco, Italy. Parasitism of the first generation of corn borer in 1929 at the former point averaged 10.9 and at the latter point 8 per cent, with a maximum of 28.6 per cent in one cornfield at St. Giorgio di Nogaro. The second generation corn borer of that year was less parasitized, averaging only 3.5 per cent at that place. It appears to occur as a parasite of the borer over most of northern Italy.

The female deposits her eggs in that of the host, and the larva passes through three stages within the growing borer. During its last stage the parasite larva issues from the fourth-instar of the corn borer, devours all remaining contents of the latter, spins a cocoon, and pupates. At a constant temperature of 77° F. 2 days are required for the incubation of the egg of Chelonus; about 20 days are needed for the total larval growth; and pupation, at that temperature, takes an average of 9.5 days. Higher or lower temperatures shorten or lengthen development of the parasite in all stages, and under field conditions it is probable that the egg-to-adult period covers about 40 days. In northern Italy the parasite, like the host, has two generations each year. It overwinters as a late first-stage larva within the fourth-instar borer and in early May resumes development.

The first importation of *C. annulipes* into the United States was made in the summer of 1929, and during 1929 and 1930 a total of 10,767 individuals were shipped from Italy.

Studies of Habrocytus cerealellae (Ashmead), a pteromalid parasite of the Angoumois grain moth, Sitotroga cerealella (Olivier), N. S. NOBLE (*Calif. Univ. Pubs. Ent., 5 (1932), No. 16, pp. 311–354, figs. 42*).—This is a report of studies of the morphology and biology of a pteromalid, the adult female of which parasitizes the larvae of the Angoumois grain moth within infested grain. In work conducted at Berkeley, Calif., it was found that the parasite would oviposit on host larvae dissected from the grain, and in this way it was possible to watch the development of the parasite throughout its entire life cycle. At a temperature of from 75 to 77° F. the incubation period varied from 31 to 35 hours, the larval period varied from 3.5 to 4.5 days, the prepupal period varied from 1.5 to 3 days, and the pupal period varied from 5 to 6.5 days. The average life cycle of 214 individuals at this temperature was 13.25 days with a minimum of 12 and a maximum of 16 days, the life cycle of the male being slightly less than that of the female. At the same temperature the average life cycle of 141 host individuals was 46.68 days, with a minimum of 33 days and a maximum of 70 days. The total of the progeny of four fertilized females was 1,014, of which 26.13 per cent were males and 73.87 per cent females.

Behavior of Trichogramma in field liberations, J. C. SCHREAD (*Jour. Econ. Ent., 25 (1932), No. 2, pp. 370–374, fig. 1*).—The study here reported has shown that *T. minutum* liberated in a block of 121 trees without parasites dispersed in all directions and resulted in 50 per cent parasitism. Another orchard with low parasitism increased 58 per cent after a single liberation. A third orchard having high natural parasitism was not increased by large liberations. The parasite flew 24 ft. under laboratory conditions.

The results from two years' experiments in mass liberations of Trichogramma minutum against the oriental fruit moth, H. W. ALLEN and A. J. WARREN (*Jour. Econ. Ent., 25 (1932), No. 2, pp. 374–380, fig. 1*).—In 16 experi-

mental liberations of *T. minutum* Riley made in blocks of late peaches in New Jersey during 1930 and 1931, a reduction of fruit infestation was observed during both seasons. They were, however, so small as to be of insignificant economic importance.

Studies in the biology of Xylonomus brachylabris Kr. and X. irrigator F., parasites of the larch longhorn beetle, Tetropium gabrieli Weise, R. N. CHRYSTAL and E. R. SKINNER (*Forestry, 5 (1931), No. 1, pp. 21–33, pls. 2*).—Following an introduction and a brief account of the genus Xylonomus, notes are given on the flight period and pairing habits of the species, the several stages are described, and notes are given on their occurrence, paralysis of the host larvae by the parasite, percentage of parasitism, an observation on parthenogenesis, a hyperparasite (*Calosota anguinalis* Ruschka), and on the morphology of the head of the last-stage larvae of the two species.

Four new North American species of Bassus Fabricius (Hymenoptera, Braconidae), with notes on the genotype, C. F. W. MUESEBECK (*Jour. Wash. Acad. Sci., 22 (1932), No. 12, pp. 329–333*).—Four species of this braconid genus described as new are *B. petiolatus* from Alamogordo, N. Mex.; *B. parvus* from an undetermined host infesting *Cupressus macrocarpa* at Palo Alto, Calif.; *B. reticulatus* from southern Illinois; and *B. brevicauda* parasitizing the pistol case bearer in Jefferson County, W. Va.

Toxicity studies by hypodermic injection of Celerio lineata larvae, G. HOCKENYOS and J. LILLY (*Jour. Econ. Ent., 25 (1932), No. 2, pp. 253–260, pl. 1, figs. 2*).—The authors report that in the comparative study of the toxicity of insecticides it sometimes seemed advantageous to inject their solution directly into the insect body and thus eliminate the extra factor of absorption. A technic for this procedure is given for use on large larvae. A satisfactory end point of paralyzation of the neuromuscular activity is also established. Data are presented graphically which indicate that for both organic and inorganic materials there appears to be an optimum point of dilution at which it can be most efficiently used. Some possible reasons for this are suggested. This method also appears to have possibilities for such physiological studies as the working of the nervous system and the absorption of materials by tissue cells.

The pear leaf blister mite as a cause of fruit-bud injury, A. D. BORDEN (*California Sta. Circ. 324 (1932), pp. 8, figs. 3*).—For a number of years many pear orchards in California have suffered considerable damage from dead fruit buds during the winter, weak flowers at blooming time, and russeted, misshapen fruit at harvest. The injury, found to be due to the pear leaf blister mite which causes the blistering of leaves on pear and apple, has greatly increased during the past 4 years, in some cases having resulted in a total loss of the pear crop. In 1931 the appearance of similar injury on apples in the Sebastopol district added to the economic importance of the problem. Its injury to fruit buds and new growth of both Gravenstein and Delicious apples resulted in the killing of practically all of the fruit buds in parts of the tree.

This mite was first reported as found in pear orchards in the State in 1895, and was first recorded in California in 1928 as the cause of this bud injury although this had been reported in South Africa 4 years earlier. In Oregon, Washington, and elsewhere the mite has become a serious pest of apples within the last 10 years. Descriptions are given of the bud form and the blister form, their habits and types of injury being almost totally different although no structural differences have been found.

The migratory period of the pear leaf blister mite, in August and September, appears to be the most logical time for control applications, even though the trees are in foliage. The success of the treatment depends upon destroying the mites before they enter the fruit buds, which, in some localities, requires spraying just as soon as the crop is removed and in others applications made during early September.

In work on experimental plats in three counties in the fall of 1930 a number of materials were tested. The 7.5 and 10 per cent lime-sulfur applications killed many mites and gave about 50 per cent increase in the amount of No. 1 pears harvested in 1931. In none of the plats where the mites were starting to enter the fruit buds did the 2 per cent light oils or the 2.5 or 5 per cent lime-sulfur show appreciable results. All of the oil and lime-sulfur combinations gave a satisfactory kill of mites considering the fact that many mites were already under the bud scales when the applications were made. It is concluded that lime-sulfur at 7.5 and 10 per cent if applied sufficiently early will give a satisfactory control.

More data on the lung fluke, Paragonimus, in North America, D. J. Ameel (*Science, 74 (1931), No. 1924, pp. 493, 494*).—The author reports upon studies conducted in which, working independently and without knowledge of the work of Wallace (E. S. R., 66, p. 571), he determined the mink to be the normal definitive host of the Paragonimus lung fluke in North America. A metacercaria closely resembling that of the Asiatic lung fluke was discovered in the pericardial region of 60 per cent of the *Cambarus propinquus* collected in Fleming Creek, a stream several miles east of Ann Arbor. Cysts were fed at intervals to a cat which developed the characteristic Paragonimus cough. On September 4, 1930, 10 weeks after the first experimental feeding, the cat was killed and 43 worms of various ages as well as thousands of eggs were recovered from the lungs. Subsequent examination of crawfishes from the same stream revealed that *C. robustus* also harbored the metacercariae, but very few individuals were infected. Collections of stream crawfishes added another host species, *C. virilis*. "Wallace found metacercariae in a single species, *C. immunis spinirostris*. Apparently any species of crawfish occurring in the appropriate environment will serve as an intermediate host, though some species prove to be more capable hosts than others.

"To determine the distribution of the lung fluke and its normal host in Michigan, there were secured from trappers all over the State, during the 1930 trapping season, 1,011 carcasses of fur-bearing animals consisting of 563 minks, 308 raccoons, 109 opossums, 22 weasels, 8 muskrats, and 1 badger. The flukes were found only in minks, of which 17 per cent carried the infection."

Attempts to infest opossum and raccoon resulted negatively, but the muskrat was experimentally infested. The studies indicate that this fluke rarely occurs in cats and dogs.

The muskrat, a new host for Paragonimus, D. J. Ameel (*Science, 75 (1932), No. 1945, p. 382*).—The author reports that since the contribution above noted was prepared he has found the mammalian lung fluke, *Paragonimus* sp., in 12 per cent of the 79 wild muskrats collected in two localities in western Michigan.

Chickens definitive hosts to species of Prosthogonimus, O. Lakela (*Poultry Sci., 11 (1932), No. 3, pp. 181–184, figs. 4*).—This contribution from the Minnesota Experiment Station reports on the infestation of ducks and chickens through the feeding of fluke-infested dragon fly nymphs. The fluke resembled *P. pellucidus* (v. Linstow) in many respects.

ANIMAL PRODUCTION

Growth and development with special reference to domestic animals, XVII–XIX, XXIII (*Missouri Sta. Research Bul. 186 (1932), pp. 5–70, 89–101, figs. 35*).—This series of studies (E. S. R., 64, p. 670) has been continued. Parts XX–XXII are noted on page 626.

XVII. *Relation between resting energy metabolism and body weight in growing domestic mammals*, S. Brody, W. C. Hall, A. C. Ragsdale, and E. A. Trowbridge (pp. 5–44).—Data for resting energy metabolism of dairy and beef cattle, sheep, horses, and swine from birth to about 3 years of age are presented. The resting metabolism included the heat increment of feeding and was taken to be identical with the maintenance needs of the resting animal for metabolizable energy under given conditions.

Evidence is presented to show the impracticability of using surface area as a unit of reference for comparing metabolism of different species. The exponential equations $Q/m=Ae^{-km}$ or $Q/m=Ae^{-km}+C$, in which Q is the heat production for weight m, and C is the lowest or limiting value of Q/m, were used in this study.

The metabolic rates of pregnant animals were above the general level indicated by the equations, while for lactating animals the rates were still higher. Other things being equal, the lightest feeders had the lowest resting metabolism and the heaviest feeders the highest. Dairy cattle males had a 10 per cent higher metabolic level than females, swine males a 20 per cent higher metabolism than females, and castrated males in cattle and swine about the same metabolism as females when feed intake was the same. While female beef animals had a slightly lower metabolism than female dairy animals, the difference was probably due to differences in food intake and not to breed differences.

XVIII. *Relation between basal metabolism, resting metabolism, heat increments of feeding and body weights in growing farm mammals*, S. Brody, W. C. Hall, A. C. Ragsdale, and E. A. Trowbridge (pp. 45–65).—Data on the basal metabolism from birth to 3 years of age are presented in this paper and are compared with the resting metabolism data. Basal metabolism followed the same course with increasing weight as resting metabolism. The basal metabolism values were from 25 to 30 per cent less than the resting metabolism values, the difference constituting the heat increment of feeding. The absolute heat increment of feeding followed an exponential course with increasing body weight in the same manner as did basal and resting metabolism.

XIX. *Relation between basal metabolism and body weight in the growing domestic fowl*, S. Brody, E. M. Funk, and H. L. Kempster (pp. 67–70).—The energy metabolism of the domestic fowl covering the period from hatching to practical maturity is analyzed in this paper. The metabolism per unit weight declined exponentially with increasing weight during growth. The metabolism of mature males was from 8 to 10 per cent higher than females. Heavy capons had a somewhat lower metabolic rate than females.

XXIII. *Relation between basal metabolism and mature body weight in different species of mammals and birds*, S. Brody and R. C. Procter (pp. 89–101).—In this paper the law relating metabolism to body weight of mature, or practically mature, animals of different species is presented. For mature domesticated animals the basal metabolism increased with the 0.734 power of body weight, of "wild" birds with the 0.64 power of body weight, and of mammals and birds combined with the 0.685 power of body weight. The metabolism per unit weight raised to the above powers was, respectively, 70.4, 89, and 86.5. Practically all of the observed values were within ± 20 per cent of these equation values.

Over 50 different species of mammals and birds are included in these equations, ranging in body weight from 10 to 1,000,000 g and in metabolism from 4 to 10,000 calories per day. The metabolism-weight curves of growing animals did not coincide with and did not have the same slope as the metabolism-weight curves of mature animals of different species. This suggests that metabolism during growth is an exponential function of body weight and metabolism of different mature species is a power function of body weight.

The greater the rapidity with which a species reached maturity, the greater was the rate with which its metabolism declined with increasing weight. The metabolism per unit weight was a function of the size of the species and its state of maturity. Swine and sheep appear to have the relatively lowest metabolism, and cattle and horses the highest metabolism among domestic animals.

Effects of nutrition and heredity upon litter size in swine and rats, H. P. Morris and D. W. Johnson (*Jour. Agr. Research* [*U. S.*], *44* (*1932*), *No. 6*, *pp. 511–521*, *figs. 4*).—In this study at the Minnesota Experiment Station the data for rats were obtained from the records of the division of agricultural biochemistry, while the data for swine were obtained from the American Poland China Record. Some of the rats had been fed a diet of natural feedstuffs designed to produce normal growth and reproduction, while others were fed diets low in nutritive value. For the swine work the records of 1,035 litters were selected at random.

The results with swine showed that there had been an increase in average litter size for the Poland China breed of one pig per litter from 1900 to 1920. There was also an increase in average litter size of swine as the dam increased in age to 60 months. With swine the correlation coefficient between size of litter in which the dam was born and the size of litter produced by her was very low, and with rats was essentially zero in 364 litters. The coefficient correlation between age of dam and size of first litter was not significant for either swine or rats. Small litters resulted when the dam was maintained on a poor diet.

The results showed that the size of first litter was not an accurate index of the size of subsequent litters.

Nutrition studies (*New Hampshire Sta. Bul. 262* (*1932*), *pp. 11, 12*).—Digestion experiments and metabolism measurements by E. G. Ritzman in cooperation with F. G. Benedict of the Carnegie Institution of Washington include studies on net energy determinations for maintenance of dairy cows on various common feedstuffs, the metabolism of the horse, and the effect of castration on energy metabolism.

[**Studies in nutrition**] (*New Jersey Stas. Rept. 1931*, *pp. 6, 7*).—Progress results are contained in this report of studies on the relation of greenness in plant tissue to vitamin A potency, the cause of increased uric acid in the blood of young chicks on vitamin A-deficient rations, means of increasing the potency of irradiated ergosterol and ascertaining why this material is not as effective as biologically equivalent amounts of cod-liver oil, factors involved in egg production and hatchability, and growth studies with white rats.

The yellowing of the abdominal fat of frozen rabbits, J. R. Vickery ([*Gt. Brit.*] *Dept. Sci. and Indus. Research, Food Invest., Spec. Rpt. 42* (*1932*), *pp. IV+27*, *figs. 5*).—This study was undertaken at the Low Temperature Research Station, Cambridge, England, to determine the cause and methods of control of the yellowing of fatty tissue during cold storage. While the condition is not confined to rabbits, they were used in this work.

It was found that the yellowing was essentially a chemical reaction between the oxygen of the air and the fat itself. Certain substances, such as an oxidase contained in the fatty tissues, water, and hemoglobin catalyzed the reaction. The extent of yellowing was dependent upon the temperature and duration of storage, the access of air, and the presence of the catalysts.

The methods devised to eliminate or at least greatly reduce the yellowing were the exclusion of oxygen from the fatty tissues, the exclusion of hemoglobin from the tissues, the reduction of the length of the storage periods, and storage at relatively low temperatures.

[Experiments with livestock] (*California Sta. Rpt. 1931, pp. 57, 58, 59–61, 92, 93*).—In the experimental work with beef cattle, data are reported on calcium and phosphorus metabolism during pregnancy and lactation on restricted mineral diets and on factors influencing percentage calf crop in range herds.

In sheep studies data are reported on the production of California spring lambs, value of fish meal and tankage as protein supplements in lamb-fattening rations, the value of cottonseed meal, sesame meal, and peanut meal as protein supplements for barley and Sudan grass hay, and breaking stress and textile strength of medullated and nonmedullated wool fibers from the same individuals.

The tests with hogs include data on the relation of nutrition and light rays to skeletal deformities in swine, vitamin A content of barley, and effects of diets low in vitamin A.

Poultry tests include investigations on shell texture, determinations of pentosans in feeds, protein requirements of baby chicks, sardine oil as a source of vitamin D, digestibility of starch of oats and barley by adult and baby chicks, linkage tests of rose comb and "creeper" characters, mortality of embryos during incubation, effect on hatchability of 12 hours of current interruption on electrical incubation with room temperatures at about 70° F., the blastoderm of unincubated eggs, influence of environmental temperature and humidity on metabolism and food utilization in chicks, and value of artificial heat in a poultry house.

[Experiments with livestock] (*Florida Sta. Rpt. 1931, pp. 49, 50, 53–55*).—The work with beef cattle included grazing studies on burned and unburned pastures and methods of improving pastures, and the value of grazing for fattening cattle in beef production and the cost of wintering steers preparatory to summer fattening on pasture, by A. L. Shealy.

In the pig studies data are reported on a comparison of various grazing crops with dry lot feeding for pork production and fattening fall pigs for spring market, by Shealy.

[Experiments with livestock in Indiana] (*Indiana Sta. Rpt. 1931, pp. 14–17, 45–49, 50, 53, 54, 55, 56, figs. 2*).—Under tests with hogs are found notes on the shrinkage of hogs trucked to market, marketing of hogs from different sections, vegetable protein as a supplement to tankage, mixing minerals with tankage, feeding wheat to hogs, deficiencies of a corn-soybean ration, brood sow feeding, need of range for sows and pigs, and anemia in swine.

The cattle tests included studies on oats for fattening cattle and the value of fine-ground oats in the fattening ration.

The sheep tests were made up of protein supplements for oats for fattening lambs, the value of grinding oats in fattening rations, fattening of native cull lambs, the tendency for ground oats to form urinary calculi, and rations for ewes nursing lambs.

The poultry reports include data on the utilization of wheat in chick rations, protein requirements of growing pullets, supplying salt for growing chicks by

meat scrap, vitamin A not destroyed by exposure of ground yellow corn to air, poultry housing tests, cooperative shipping of eggs, young turkeys need more protein than chicks, and weights and feed requirements of turkeys from 18 to 28 weeks of age.

The nutrition studies report data on the effect of artificial drying upon the vitamin A content of alfalfa, yellow color as an index of the vitamin A value of corn, and soybeans as a supplement to corn.

[Experiments with livestock] (*Nebraska Sta. Rpt. [1931], pp. 24–29, 34–37, 41, 42, 45*).—Preliminary results of studies with beef cattle, sheep, hogs, and poultry are included in this report.

The tests with beef cattle include wintering rations for stock calves, cottonseed cake as a supplement to either silage or fodder, corn v. wheat for finishing 3-year-old grass-fat steers, effect of winter rations upon rate and economy of summer gains, corn, wheat, and rye for fattening calves, creep-feeding calves, the use of alfalfa pasture for fattening cattle, and the cost of wintering beef calves.

Under swine tests are noted results on forage crops for hogs, wheat v. corn for fattening hogs, skim milk and whey for fattening hogs, hard v. soft endosperm corn as pig feed, a comparison of wheat, rye, and proso with corn for fattening hogs, and factors affecting the quality and palatability of meat.

In the sheep work are included a comparison of wheat and other grain rations for fattening lambs and a comparison of corn and wheat with various supplements for fattening lambs.

The poultry experiments included a study of the comparative efficiency of various proteins in poultry feeding, nutritive requirements of growing chicks, and effect of variations in weight loss of turkey eggs on the growth rates of poults hatched.

By-products of the fishing industry as animal feed, G. W. Johnston and L. H. Bartel (*Farming in So. Africa, 7 (1932), No. 75, pp. 116–118*).—In tests with pigs at the University of Stellenbosch, South Africa, it was found that at the same price per ton whale meal and bone meal were more economical protein supplements than crawfish meal. However, the latter feed proved to be an excellent protein supplement, and pigs fed it appeared to make more uniform growth than those fed whale meal or bone meal. The differences in the quantity and composition of the ash of these feeds had no detrimental effects on the pigs.

Acorns fed dry were eaten readily, but had somewhat less than 50 per cent the feeding value of corn meal.

Vitamin A and protein content of various fish meals, L. A. Maynard, R. C. Bender, and C. M. McCay (*Jour. Agr. Research [U. S.], 44 (1932), No. 7, pp. 591–603, figs. 3*).—Continuing this study at the New York Cornell Experiment Station (E. S. R., 66, p. 655), seven different fish meals, five of them commercial products sold for animal feeding, were studied. A preliminary test showed marked differences for promoting growth of rats on the commercial products when fed as supplements to corn meal, but all except one gave better results than tankage. A vacuum-dried white fish meal was found to be a good source of vitamin A in contrast to a steam-dried meal and to flame-dried menhaden meals, which were lacking in this vitamin. The vacuum-dried white meal was also superior to the steam-dried menhaden in protein efficiency for growth, and the latter was superior to a flame-dried menhaden. The results suggest that the heat treatment received by the meals was at least partially responsible for the nutritive differences found.

Nitrogen-balance studies with various fish meals, B. H. Schneider (*Jour. Agr. Research [U. S.], 44 (1932), No. 9, pp. 723–732*).—Continuing the studies

at the New York Cornell Experiment Station noted above, two nitrogen balance tests were conducted with a total of 12 growing rats. On the basis of the digestibility of their proteins, fish meals ranked in the following order: Vacuum-dried white fish meal, steam-dried menhaden meal, and flame-dried menhaden meal. Similar results were obtained with two growing pigs in a comparison of white meal and the flame-dried menhaden.

In regard to the utilization of absorbed nitrogen, the vacuum-dried white meal proved significantly superior to the flame-dried menhaden for both rats and pigs. In both rat studies the white meal was numerically superior to the steam-dried menhaden and the latter was superior to the flame-dried product, but differences were significant in the second experiment only.

Nutritive properties found in tobacco seed (*Connecticut State Sta. Bul. 337 (1932), p. 455, fig. 1*).—Preliminary results of studies of the nutritive value of tobacco seed on rats and pigeons are reported.

Commercial feeding stuffs—report on inspection, 1931, E. M. Bailey (*Connecticut State Sta. Bul. 336 (1932), pp. 275–447+XXIII*).—This is the usual report of the guaranties and analyses of feeds officially inspected during the calendar year 1931 (E. S. R., 65, p. 255).

Commercial feeding stuffs, H. R. Kraybill et al. (*Indiana Sta. Circ. 189 (1932), pp. 36, fig. 1*).—Examination of 2,804 samples of commercial feeding stuffs collected during the year 1931 and subjected either to microscopic examination or to chemical analysis showed that 85 per cent of the samples were equal to or better than the manufacturer's guaranty and that 271 samples were seriously deficient (E. S. R., 65, p. 659).

Returns per acre in cattle feeding, IV, P. Gerlaugh and H. W. Rogers (*Ohio Sta. Bimo. Bul. 157 (1932), pp. 151–154*).—Continuing this study (E. S. R., 65, p. 659), 2 lots of 16 steers, averaging approximately 689 lbs. per head, were fed a basal ration of clover hay and cottonseed meal. Lot 1, receiving corn silage, was fed for 166 days, and lot 2, fed ground shock corn, was fed for 154 days. The average daily gains in the respective lots were 2 and 1.8 lbs. per head.

The steer days fed per acre of corn were 374 and 350 in the respective lots. Lot 1 returned 759 lbs. of beef and 17 lbs. of pork and lot 2 622 lbs. of beef and 17 lbs. of pork per acre of corn fed. The gross returns from feed per acre were $44.25 in lot 1 and $30.95 in lot 2, while the net returns per acre of corn fed to cattle were $21.95 and −$1.79, respectively.

The calcium requirement of brood sows, A. G. Hogan (*Missouri Sta. Research Bul. 167 (1932), pp. 18, fig. 1*).—This study (E. S. R., 62, p. 64) was undertaken to determine the minimum amount of calcium that could be fed safely to female swine and still permit approximately normal rearing of young. While several different breeds of swine were used, the data did not indicate that any of them was more resistant than others to experimental rations. The sows were maintained under experimental conditions for about 1 year and reared their litters, but the weaning weights of the pigs were not altogether satisfactory.

It was shown that the rations of brood sows should contain not less than 0.4 per cent of calcium. While the diameter of the metacarpal bone was not decreased by rations deficient in calcium, the walls were thinner and were porous instead of being dense and hard. This condition reduced the amount of dry matter, but the percentage composition of the bone remained unchanged. The complete failure following the use of two different mineral mixtures was explained as due to the presence of toxic impurities in the mixtures.

Swine reproduction in relation to nutrition, A. G. HOGAN (*Missouri Sta. Research Bul. 168 (1932), pp. 24, figs. 3*).—Continuing this study (E. S. R., 66, p. 360), female pigs, placed on floors of wood or cement at weights of from 50 to 100 lbs. and kept there continuously until they had weaned or lost their first litters, did not raise thrifty pigs. Their rations consisted for the most part of commonly used feedstuffs, but no green forage. The condition of the weanling pigs was interpreted as an indication that the commonly used feeds are inadequate for swine over a long period of time, even when supplemented with 5 per cent of alfalfa meal.

There was no evidence to show that the unfavorable results were due to a lack of exercise, sunlight, or vitamin C. Special precautions to prevent anemia had no apparent effect on the rate of growth or appearance of the pigs. The failure in lactation could not be attributed to the calcium-phosphorus ratio.

In one case a third generation of pigs was produced, and these animals were very inferior showing that the unfavorable effects of this procedure were cumulative.

[**Experiments with swine**], W. C. SKELLEY (*New Jersey Stas. Rpt. 1931, pp. 21, 22, 103–109*).—Progress reports with swine include a comparison of fish meal and tankage on the growth of swine and the quality and palatability of pork produced, a comparison of vegetable and animal protein combinations in the feeding of swine, dried caplin fish v. tankage as a protein supplement for swine, and the value of Manamar and Kraco, a milk-sugar feed, in swine rations.

Swine feeding experiments, 1931, W. L. ROBISON (*Ohio Sta. Spec. Circ. 39 (1932), pp. 25*).—The studies reported in this publication are continuations of work previously noted (E. S. R., 65, p. 166).

Oats for pigs.—In this test hulled oats fed with corn, trio mixture, and minerals produced faster gains and more gain per unit of feed than unhulled oats, but a ration containing the hulled oats was no more efficient than a ration without them. When linseed meal was omitted, pigs failed to gain as much from a given amount of feed as those receiving linseed meal.

Fish meal and kelp for fall pigs.—A mixture of fish meal and tankage was less effective than fish meal alone for feeding with corn and ground alfalfa. Fish meal alone proved somewhat more efficient than a mixture of tankage and linseed meal. No fishy flavors were discovered in samples of meat from pigs fed fish meal. Dried kelp fed at a 1.5 per cent level decreased the rate and efficiency of gains as compared with a similar ration containing no kelp.

Supplements to corn for dry-lot feeding.—Dry-rendered tankage was worth 14 per cent more than ordinary tankage as a supplement to corn. Approximately 11.5 lbs. of skim milk were equal to 1 lb. of tankage in this test. Menhaden fish meal proved to be superior to either type of tankage in both rate and economy of gains produced.

Cottonseed meal for pigs.—When 43 and 36 per cent of cottonseed meals were fed at 20 and 25 per cent levels, respectively, until the pigs averaged 120 lbs. in weight and at 15.7 and 20 per cent levels, respectively, thereafter, 5 of 8 pigs in each of 2 lots died. Moistening and autoclaving the 43 per cent meal at 14 lbs. pressure for 30 minutes reduced the losses to 2 out of 8 pigs. No bad effects were observed when untreated 43 per cent meal was fed at lower levels and tankage or a mixture of tankage and coconut meal was included in the ration. A special cottonseed meal caused no death losses, regardless of the manner of feeding. Linseed meal was satisfactory for feeding with tankage at both 4.6 and 15.8 per cent levels.

Making cottonseed meal safe for pigs.—When a cottonseed meal containing approximately 41 per cent of protein and known to be toxic when fed alone was combined with tankage at an 8 per cent level, no harmful effects were noted. A mixture of equal parts of cottonseed meal and soybean oil meal gave as good results as a mixture of tankage and linseed meal 2:1. In this test cottonseed meal did not prove as effective as linseed meal in the trio supplement mixture.

Cottonseed meal, at high and low levels, with tankage.—Pigs receiving the trio supplement containing 20 per cent of cottonseed meal gained only 85 per cent as rapidly as pigs receiving a similar ration containing only 4 per cent of cottonseed meal.

Full and limited feeding on rape pasture.—Pigs that were self-fed corn and tankage on pasture made more rapid but less economical gains than pigs that were hand full-fed. When the grain ration was limited during the entire feeding period, the gains were slower than in other lots but were more economical. Limited feeding at first and full feeding later were not as profitable in this test as in earlier work. The advantages of shelled corn, whether self-fed or hand-fed, over ear corn were not sufficient to pay for the cost of shelling.

Preparation and method of feeding corn.—Pigs consumed practically as much shelled corn as ear corn per unit of gain when fed on pasture. On the basis of feed required per unit of gain, ground corn fed dry was worth 3 cts. more per bushel than ear corn, but there was nothing gained by wetting the ground corn and feeding it as a slop.

Full and limited feeding on pasture with limited-fed pigs finished in dry lot.—In this test pigs were self-fed on rape pasture until they reached an approximate weight of 200 lbs., and compared with a similar lot given a limited feed on rape for 18 weeks and then hand full-fed in dry lot for 5 weeks. The second lot required more feed per unit of gain than the first lot and also took 48 days longer to reach the final weight. On the basis of the prices of new and old corn over an 8-year period, the returns per acre over feed and pasture costs were $3.18 for the full-fed pigs and $2.69 for the limited-fed pigs.

Methods of feeding oats to pigs on red clover pasture.—Pigs self-fed ground oats, shelled corn, and tankage in separate compartments while on pasture gained rapidly and economically, but made little use of the oats. Where a mixture of ground oats and tankage 4:1 was fed, the pigs consumed more oats and the tankage consumption was reduced from 9.7 to 3.9 per cent of the ration. When the mixture of oats and tankage was self-fed and the corn hand-fed, the pigs ate more oats than in either of the other methods of feeding. They also ate more total feed and made more rapid and economical gains than when both corn and the mixture were self-fed.

Comparison of forage crops.—In this test alfalfa pasture plus shelled corn and tankage produced the most rapid gains, but corn and minerals on alfalfa produced the most economical gains. Peruvian alfalfa with winter wheat and soybean pasture were practically equal in producing gains economically. Sudan grass and rape produced gains at the same rate, but the rape pasture was more economical. Sweetclover with winter wheat was the poorest forage tested from the standpoint of rate and economy of gains.

[**Hog feeding tests**] (*Maryland Sta. Rpt. 1931, p. XIV*).—Preliminary reports are made of feeding tests with hogs comparing corn and wheat and comparing various protein supplements for feeding with corn.

[**Poultry experiments**] (*New Hampshire Sta. Bul. 262 (1932), pp. 24, 25*).—This report includes further studies on measuring vitamin A requirements of chicks, a comparison of brooder temperatures, and added protein in raising gains of chicks, by A. E. Tepper, H. O. Stuart, and T. B. Charles.

[Experiments with poultry]. W. C. THOMPSON (*New Jersey Stas. Rpt. 1931, pp. 55–57, 324–330, figs. 2*).—This report includes preliminary results on statistical and practical values of short-time trap nest egg production performance records, the measurement of egg size quality, the feasibility of stud mating in a practical poultry breeding scheme, life span of a race of commercial fowls, development of an experimental strain of White Leghorns, systematic method of improving egg size, battery brooding, broiler production, all-mash rations, green food, the New Jersey multiple-unit laying house, and cage bird housing.

Free choice of whole grain and mash concentrate for layers, D. C. KENNARD and V. D. CHAMBERLIN (*Ohio Sta. Bimo. Bul. 157 (1932), pp. 154–158*).—This study was undertaken to determine the feasibility of feeding laying birds by free choice of whole grains and a mash concentrate. Pullets on all-mash laid more eggs than similar pullets on a free-choice ration. The all-mash ration required that 3.73 times as much grain as mash be consumed, while the flock average on free choice was 5.9 times as much grain as mash. This is an important factor since it emphasizes the fact that birds out of production can maintain themselves largely on the less expensive grain part of the ration.

In this work egg production generally was in accord with expectations for the age, breeding, and quality of birds used. The method is suggested for farm poultry producers who raise their own grains since the method involves the least amount of time and labor for feeding. The value of the method for heavy breeds of birds has not been determined.

DAIRY FARMING—DAIRYING

[Experiments in dairy farming and dairying] (*California Sta. Rpt. 1931, pp. 58, 59, 64–66*).—Data are reported as to tests of a respiration apparatus for cows, studies of alfalfa juice to determine the minimum time after ingestion of feed flavors in liquid form that feed flavor could be detected in milk, effect of sunlight on creamed and uncreamed cottage cheese, influence of metals on milk, factors influencing the quality of churned buttermilk, foam formation of skim milk, effect of a ration restricted to alfalfa hay on the production of abnormal milk fat, the relation of the ratio of calcium and phosphorus in the ration to the coagulability of milk by rennin and by alcohol, manufacture of Gorgonzola-type cheese, distribution of various components of ice cream between its liquid and solid phases, and effect of metals upon the flavor produced in vanilla ice cream.

[Experiments with dairy cattle] (*Florida Sta. Rpt. 1931, pp. 51, 52*).—This report includes preliminary results on the value of soybean silage for dairy cows, by R. B. Becker, and deficiencies in feeds used in cattle rations, by W. M. Neal, A. L. Shealy, and Becker.

[Studies with dairy cattle and dairying] (*Indiana Sta. Rpt. 1931, pp. 23–25, 26, 27, 49, fig. 1*).—The progress reports with dairy cattle include results on early-, intermediate-, and late-cut soybean hay for milk and butterfat production, yields of hay per acre at different stages of maturity, chemical analyses of soybean plants during the growing period of 1930, and ground soybeans v. linseed meal as protein supplements for growing heifers.

The studies in dairying include notes on the value of mechanical refrigeration on dairy farms, a study of the physical, chemical, and bacteriological factors affecting body, texture, and quality of ice cream—freezing, hardening, and storage as pertains to the body, texture, and quality of hardened ice cream, bacteriological studies to determine the number of bacteria in ice cream

samples, the extent to which a single-valve homogenizing pressure may be substituted for gelatin in affecting the body and texture of ice cream, and dairy marketing investigations.

[**Experiments with dairy cattle and dairy products**] (*Maryland Sta. Rpt. 1931, pp. XIII, XIV*).—This report includes preliminary results of comparisons of oat-hull feed and ground alfalfa hay and dry feeds for heifers when no pasture is available.

Dairying studies on the effect of freezing of milk on its food value and the efficiency of an electric sterilizer are briefly noted.

[**Experiments with dairy cattle and in dairying**] (*Nebraska Sta. Rpt. [1931], pp. 11–14, 45, 46*).—The work with dairy cattle for which results are reported included a study of growth, the vitamin content of field-cured and artificially-cured hay, and methods of feeding grain for economical milk production.

Results are briefly noted of studies on strawberries as a source of yeast and molds in ice cream making, the deficiencies of homogenization of the ice cream mix, factors affecting freezing conditions, and factors affecting the accuracy of the standardization of the fat and solids content of ice cream; studies of "fat-soluble A" as present in the milk of Holstein, Ayrshire, Jersey, and Guernsey cattle; and factors affecting the quality of fluid milk as shown by the fat test, sediment test, and bacterial count.

[**Experiments with dairy cattle and dairy products**], J. W. BARTLETT ET AL. (*New Jersey Stas. Rpt. 1931, pp. 26–28, 124–136*).—This report includes preliminary results on minimum milk requirements for raising calves, by C. B. Bender, Bartlett, and F. Gauntt; the effect of nitrogen fertilization on the carrying capacity of pastures, and heifer feeding, by Bender and Gauntt; the effect of nitrogen fertilization on the protein content of corn, by Bender; the effect of the feeding of organic iodine to dairy cows as a means of controlling contagious abortion, the relation of Mo-Lac as a fly repellent to the milk production of dairy cows, and the value of buckwheat middlings in the rations of the dairy cow.

The studies of dairy products included a study of the effects of certain glycerides and fatty acids on processing of ice cream, the churning of butter, and the whipping of ice cream; the stabilizing of cocoa particles in chocolate milk; the use of Pomosin in ice cream; titratable acidity of fresh milk; and the effect of sterilization on canned ice cream mix, all by F. C. Button; and causes of "pimples" in sour cream.

Bulk as a factor in formulating grain mixtures for dairy cattle, L. A. MOORE, C. F. HUFFMAN, and M. M. PLUM (*Jour. Agr. Research [U. S.], 44 (1932), No. 10, pp. 789–796, figs. 3*).—Continuing this study at the Michigan Experiment Station (E. S. R., 65, p. 765), a total of 32 animals, one of which had a rumen fistula, were fed 5 lbs. of certain concentrates a specific number of hours before they were slaughtered. After an animal was slaughtered the contents of the rumen were carefully sorted for lumps or boli present.

The results of the study showed that ground feeds all go to the rumen and reticulum and are mixed with the contents of these parts of the digestive tract. After being mixed they await their turn to be exposed and washed to the omasum and abomasum. When animals were fed 5 lbs. of linseed meal and were slaughtered 1 hour later, from 5 to 22.5 per cent of the feed was recovered in the form of boli, but if an animal was not slaughtered for 8 hours only from 0.04 to 1.25 per cent was recovered in this form. The results obtained with the animal with the rumen fistula checked closely with those obtained on

slaughtered animals. On the basis of these results, it is deemed unnecessary to consider bulk in compounding the grain mixture for economic milk production.

The importance of feeds as a source of ropy milk organisms, C. N. STARK and M. J. FOTER (*Jour. Bact., 21 (1931), No. 1, pp. 57, 58*).—In a study at the New York Cornell Experiment Station, 63 different kinds of feeding stuffs were examined to determine the original sources of bacteria which may cause ropiness in milk. The number of such bacteria found varied from a few hundred to many thousand per gram of material. These organisms were found in nine different grain mixtures, corn, hominy, oats, redtop, buckwheat, red clover, alsike clover, and alfalfa seed, raw soybean meal, wheat bran, cottonseed meal, ground alfalfa hay, chaff, green wheat, and green timothy hay.

Precooling milk (*New Hampshire Sta. Bul. 262 (1932), p. 22*).—Studies on the effect of the condition of the can as a source of bacteria are reported by W. T. Ackerman and H. C. Moore.

A simplified formula method of standardizing ice cream mixes and correcting offbatches, H. A. BENDIXEN (*Washington Col. Sta. Bul. 263 (1932), pp. 24*).—Simplified formulas, applicable to the problems concerned in the standardizing of ice cream mixes and offbatches, are included in this bulletin.

Studies on the freezing properties of varying aged and unaged mixes, P. S. LUCAS (*Ice Cream Trade Jour., 27 (1931), No. 12, pp. 47, 48*).—Studies at the Michigan Experiment Station showed that the aging of ice cream mixes containing 14 per cent butterfat, the fat coming from butter and cream, had no appreciable effect upon the time required for the mix to reach 100 per cent overrun. However, the longer the aging period the greater was the amount of overrun it was possible to incorporate. The aging periods in this work had no apparent effect on the body and texture of the ice cream. Regardless of the aging periods all mixes melted very uniformly. A 14 per cent butter mix, vat pasteurized, showed scarcely any increase in surface tension due to aging, and the viscosity increased but slightly after aging periods of from 1 to 4 hours although when aged 24 hours the increase was considerable. It was found commercially practicable to freeze a 14 per cent mix after 1 hour's aging.

The causes of curdled appearance in ice cream when melting, J. H. ERB (*Ice Cream Trade Jour., 27 (1931), No. 12, pp. 43, 44*).—The cause of "feathering" or curdling in ice cream when melting was studied. It is concluded that the condition is due to a destabilized protein. The factors contributing are excess soluble calcium salts in the mix serum, low pasteurizing temperatures, a high acidity coupled with high pressures of homogenization, a low serum solids to fat ratio, and low temperatures of homogenization.

VETERINARY MEDICINE

[Report of work in veterinary medicine] (*California Sta. Rpt. 1931, pp. 102–105*).—A report is made of the work of the year (E. S. R., 65, p. 769), including data on experimental vaccination of cattle and swine against tuberculosis with B. C. G., a study of the factors influencing sensitiveness to tuberculin in cattle, variants of *Brucella abortus* in cattle, the thermal death time of *B. abortus*, *B. abortus* in swine, anaplasmosis in cattle, the preservation of hog cholera vaccine by the use of eucalyptus oil, an organism similar to *Bacillus rhusiopathiae* as the cause of enzootic polyarthritis in lambs, encephalomyelitis in horses and mules, and the nature of the causative agent of laryngotracheitis in the fowl.

[Report of work in animal pathology] (*Florida Sta. Rpt. 1931, pp. 55, 56*).—Brief accounts are given of work with anaplasmosis in cattle, by D. A. Sanders, and paralysis of domestic fowl, by E. F. Thomas.

[Report of work in veterinary medicine] (*Indiana Sta. Rpt. 1931, pp. 56–59*).—This report (E. S. R., 65, p. 174) deals briefly with studies of immunity in heifers injected with living cultures of *Brucella abortus* during calfhood, various diagnoses and tests, and notes on posterior paralysis and osteomalacia in pigs, "breeding paralysis in ewes," and treatment of lambs for stomach worms.

[Work in animal pathology] (*New Hampshire Sta. Bul. 262 (1932), pp. 25–27*).—The work of the year briefly reported (E. S. R., 66, pp. 71, 76) includes accounts of testing for pullorum disease, the spread of pullorum disease from infected to noninfected fowls, and the eradication of pullorum disease, by C. A. Bottorff; a study of paralysis of poultry, by C. L. Martin and A. E. Tepper; vaccinating for fowl pox, by Martin and Bottorff; testing for infectious abortion, by Martin; the importance of autopsies in the detection of poultry diseases, by Martin and Bottorff; and the use of fowl pox vaccine.

[Contributions in animal pathology] (*Ontario Vet. Col. Rpt. 1930, pp. 16–88, figs. 11*).—The contributions here presented include the following: Hemorrhagic Septicemia in Cattle (pp. 16-19) and Urinary Lithiasis in Cattle (pp. 20-25), both by R. A. McIntosh; Perpetual Lesions in a Young Bull (pp. 25-27); Severe Case of Eczema in a Holstein Cow, by R. A. McIntosh (pp. 28-30); Tuberculosis in Swine (pp. 30, 31); Faulty Metabolism Due to Colloid Degeneration of the Thyroid Gland (pp. 31, 32); A Contagious Disease of Dogs Caused by a Bi-polar Organism, by H. E. Batt (pp. 33-36); Plerocercoids of the Genus Ligula from Ontario Fish (pp. 37, 38) and A Case of Myasis in Silver Black Fox Produced by *Wohlfahrtia vigil* (Walk.) (pp. 38, 39), both by A. A. Kingscote; Myasis in Silver Black Foxes Produced by *Lucilia caesar* Linn. (p. 39); A Note on *Parametorchis canadensis* (Law) from Ontario Mink (p. 39); The Occurrence of *Acuaria hamulosa* (Dies 1851) (Gizzard Worms) in Ontario Poultry (p. 39); A Case of Paragonimiasis in an Ontario Domestic Fox (p. 40); The Occurrence of Parenchymatous Goitre in Silver Black Foxes (pp. 40, 41) and The Prevention and Control of Parasitism in Fox Ranches (pp. 41-45), both by A. A. Kingscote; Report on Investigation Made into a Fatal Disease of Horses Occurring in the District of North Temiskaming (pp. 46-50), A Report on Endemic Cirrhosis of the Liver (Equine) Occurring in the Timiskaming District of Northern Ontario (pp. 51-56), Anemia in Suckling Pigs (pp. 57-67), Myeloblastic Leukaemia (pp. 67, 68), and The Presence of Agglutinins in the Blood of Veterinarians (pp. 68, 69), all by F. W. Schofield; The Susceptibility of the Silver Black Fox to the Virus of Canine Distemper, by F. W. Schofield and A. A. Kingscote (pp. 69, 70); Hermaphroditism in the Fowl (p. 73), A Study of the Growth of *S[almonella] pullorum* on Various Culture Media (pp. 73-76) (E. S. R., 66, p. 375), Lice (Mallophaga) on Poultry (pp. 77, 78), Immunization against Fowl-Pox (pp. 79–84) (E. S. R., 67, p. 458), Nutritional Disease (p. 85), Comparative Results of Different Periods of Incubation and Different Incubation Temperatures in Connection with the Agglutination Test for Contagious Abortion (p. 86), and Comparison of Tube and Rapid Agglutination tests for the Detection of *A[lcaligines] abortus* Reactors (pp. 87, 88), all by J. S. Glover.

Report on the Veterinary Department, Burma, for the year ending the 31st March, 1931, D. T. Mitchell (*Burma Vet. Dept. Rpt. 1930–31, pp. [5]+36, pls. 4*).—An account is given (pp. 5–10) of the occurrence and methods

of spread of and control measures for contagious diseases of livestock (E. S. R., 66, p. 174).

Parasites and parasitisms of domestic animals (*Chicago: Vet. Mag. Corp., 1931, pp. 80, figs. 115*).—This is a collection of 30 practical accounts by 24 authors, selected from *Veterinary Medicine*, 5 of which are by M. C. Hall.

Report of the parasitologist, H. L. VAN VOLKENBERG (*Porto Rico Sta. Rpt. 1931, pp. 24–27, fig. 1*).—A brief statement of the situation as regards animal parasites is followed by a brief account of the status of those of importance as external enemies of domestic animals. Reference is made to the finding that the water beetle *Tropisternus collaris* is an intermediate host, and in Puerto Rico an apparently important one, of the thorny-headed worm *Macracanthorhynchus hirudinaceus* of swine. It is pointed out that pigs often feed on the roots of water plants in swamps and thus have opportunity to swallow the beetle host.

Pharmacological study of embelin, with reference to its use as anthelmintic, A. S. PARANJPÉ and G. K. GOKHALÉ (*Arch. Internatl. Pharmacodyn. et Thér., 42 (1932), No. 1–2, pp. 212–232, figs. 6*).—The authors find that embelin, isolated from the dried fruit of *Embelia ribes* and *E. robusta*, is effective against tapeworms but has no action on roundworms, hookworms, and whipworms. The action against tapeworms is considered to be due to its constituent embelic acid, which forms about 2.5 to 2.7 per cent of the drug.

Sarcostemma australe (caustic vine): A plant that is poisonous to stock, J. A. GILRUTH and D. MURNANE (*Jour. Council Sci. and Indus. Research [Aust.], 4 (1931), No. 4, pp. 225–231*).—The caustic vine of Australia (*S. australe*) was proved to be poisonous to sheep, cattle, and horses, as well as to certain small laboratory animals. Two oz. of the plant were sufficient to produce death with certainty in an adult sheep of average size, and 32 oz. were fatally toxic to a bovine and a horse. Extracts of the plant were tested for toxicity. The toxic action of the plant is considered almost identical with that of other members of the milkweed family in the United States and South Africa.

Common dog tick found to carry anaplasmosis (*U. S. Dept. Agr., Off. Rec., 10 (1931), No. 42, pp. 313, 317*).—The work by C. W. Rees here referred to, in which the American dog tick was found capable of transmitting bovine anaplasmosis, has been noted from another source (E. S. R., 67, p. 311).

Rocky Mountain tick carries anaplasmosis (*U. S. Dept. Agr., Off. Rec., 11 (1932), No. 9, pp. 53, 59*).—Announcement is made of the finding by C. W. Rees in experiments at Jeanerette, La., that the Rocky Mountain spotted fever tick (*Dermacentor andersoni*), as well as the American dog tick, as above noted, and the brown dog tick (E. S. R., 64, p. 556), may transmit anaplasmosis of cattle. It is pointed out that several other tick forms have been reported in foreign literature as carriers of Anaplasma infection.

The dog a reservoir of the virus of boutonneuse fever [trans. title], P. DURAND (*Compt. Rend. Acad. Sci. [Paris], 194 (1932), No. 10, pp. 918, 919*).—By subcutaneous inoculation with material from the bodies of infected ticks, it was found that the dog may become a reservoir for the virus of boutonneuse fever without the appearance of clinical symptoms in the host.

Agglutinin-absorption studies on Brucella, W. N. PLASTRIDGE and J. G. MCALPINE (*Jour. Infect. Diseases, 50 (1932), No. 5–6, pp. 555–567*).—This is a contribution from the Connecticut Storrs Experiment Station (E. S. R., 67, p. 312) and the Sanidad Nacional, Caracas, Venezuela.

"Agglutinin-absorption data obtained on 142 strains of Brucella of human, bovine, porcine, caprine, and equine origin have been presented. A comparison of the identity of these strains, as determined by their ability to utilize dextrose

and their behavior on Huddleson's dye plates, with their serologic characteristics shows that the agglutinin-absorption test failed to differentiate between *B. abortus* and *B. melitensis* so far as 23, or 15 per cent, of the strains studied were concerned. In general, the results obtained confirm the opinion expressed by [E.] Burnet, namely, that while it is possible to classify some strains of *B. melitensis* as such by means of the agglutinin-absorption test, it is impossible to identify strains of *B. abortus* by means of this test with any degree of certainty. Evidence of variation in the serologic properties of the members of the genus Brucella (especially *B. melitensis*), under ordinary laboratory conditions, has been noted and discussed from the standpoint of explaining the lack of agreement in the results reported by various investigators."

Brucella antibodies in human serum, J. W. Martin and J. T. Myers (*Jour. Prev. Med., 5 (1931), No. 4, pp. 243–248*).—In studies conducted in Nebraska, Brucella antibodies were found in sera from meat packing employees as follows: "Fifteen per cent of 100 employees with 18 months on the company's sick list with symptoms suggestive of undulant fever, and 3 per cent of 100 other employees. Brucella antibodies were found in 4.3 per cent of 1,000 Wassermann sera. There was no appreciable difference in antibody incidence between negroes and white persons. The three methods of examination employed—complement fixation, macroscopic agglutination, and Huddleson's rapid macroscopic agglutination—were parallel in their results and appear to be equally accurate for laboratory diagnosis. Huddleson's method is very convenient. Either the liquid air or the shaking machine method of breaking the Brucella organisms for antigen is efficient. The optimum amount of serum to use in the complement fixation test for undulant fever is 0.1 c c."

Foot-and-mouth disease: Some peculiarities presented by the disease in Southern Rhodesia, L. E. W. Bevan (*Vet. Jour., 88 (1932), No. 3, pp. 98–107, figs. 6*).—In this account the author emphasizes certain features of foot-and-mouth disease as it occurs in Southern Rhodesia which appear to distinguish it from the foot-and-mouth disease of Great Britain and the Continent of Europe.

Studies in the histopathology of louping-ill, A. Brownlee and D. R. Wilson (*Jour. Compar. Path. and Ther., 45 (1932), No. 1, pp. 67–92, figs. 10*).—In the studies conducted lesions of meningo-encephalomyelitis were found in all natural cases of true louping ill. "Positive diagnosis of louping ill was determined by the presence of active louping ill virus in the central nervous system as demonstrated by experimental inoculation of susceptible animals. No lesions of meningo-encephalomyelitis were found in cases clinically resembling louping ill but from which no virus was obtained. Sheep infected experimentally with the virus of louping ill showed lesions similar to those found in the natural cases."

Study of an outbreak of pseudotuberculosis in guinea pigs (Cavies) due to B. pseudotuberculosis rodentium, L. M. Bishop (*Cornell Vet., 22 (1932), No. 1, pp. 1–9, figs. 3*).—In this account, presented in connection with a review of the literature, a list of 26 references to which is included, the author reports upon an outbreak of pseudotuberculosis in guinea pigs due to *Bacterium pseudotuberculosis rodentium* in which six strains of the organism were isolated. Three types of the infection were produced by varying the number of organisms inoculated and the method of inoculation. Six chickens and one cat failed to develop the disease. The gross lesions produced in guinea pigs are similar and might be confused with those produced by *B. abortus*.

Rachitis in its etiological, biochemical, pathogenetical, patho-anatomical, and clinical aspects: An experimental and comparative study, J. Marek

and O. WELLMANN. Pathological part, J. MAREK (*Die Rhachitis in Ihren Ätiologischen, Biochemischen, Pathogenetischen, Pathologisch-anatomischen, und Klinischen Beziehungen: Eine Experimentelle und Vergleichende Studie. Pathologischer Teil. Jena: Gustav Fischer, 1931, pp. VIII+362, pls. 7, figs. 171; rev. in Jour. Compar. Path. and Ther., 44 (1931), No. 2, p. 154; Vet. Rec., 11 (1931), No. 37, p. 929*).—This volume presents the pathological part of the combined researches of the authors and incorporates the essential parts of the chemical researches by Wellmann, which will form a separate volume. The six sections deal, respectively, with spontaneous rickets, experimentally produced rickets, rickets in the domesticated animals compared with that in man, the pathogenesis and histogenesis of rickets, the etiology of rickets in the light of recent research, and the cure and prevention of rickets.

The author reports upon 33 cases of spontaneous rickets in children, calves, dogs, pigs, lambs, and kids and experimentally produced rickets in 21 puppies and 41 pigs. Photographs and X-ray pictures of diseased bones and photomicrographs of the lesions are included, as is a list of 322 references to the literature.

The presence of agglutinins for bacteria of the Salmonella group in the sera of normal animals.—A preliminary report, R. LOVELL (*Jour. Compar. Path. and Ther., 45 (1932), No. 1, pp. 27-42*).—This account deals with the agglutinins for the "H" heat labile flagellar antigens of certain members of the Salmonella group which occur in the sera of healthy domesticated animals. In view of the widespread opinion that *Bacterium suipestifer* is a normal inhabitant of healthy swine, special attention has been paid to this animal. The details are largely presented in tabular form.

Sporotrichosis: Its transmission to plants and animals, R. W. BENHAM and B. KESTEN (*Jour. Infect. Diseases, 50 (1932), No. 5-6, pp. 437-458, figs. 15*).—The authors found that *Sporotrichum schenckii* produced in the monkey a nodular sporotrichosis simulating the lymphangitic type of infection in man. The human disease was transmitted to carnations, in which it produced a bud rot similar to that caused by *S. poae*. After living saprophytically or parasitically in plants, *S. schenckii* retained its virulence for animals.

Studies in the variability of tubercle bacilli, II–IV (*Canad. Jour. Research, 5 (1931), Nos. 1, pp. 111-121, pls. 3, pp. 122-129; 3, pp. 375-388, fig. 1*).—In part 2 of this contribution (E. S. R., 66, p. 176) the correlation of colony structure, acid agglutination, and virulence is dealt with by G. B. Reed and C. E. Rice (pp. 111-121), in part 3 the influence of X-rays upon dissociation, by C. E. Rice and G. B. Reed (pp. 122-129), and in part 4 the antigenic properties of S and R cultures, by C. E. Rice (pp. 375-388).

Studies on bovine mastitis, V, VI (*Jour. Compar. Path. and Ther., 45 (1932), No. 1, pp. 1-10, figs. 5; 43-57*).—Two further contributions (E. S. R., 66, p. 73) are noted.

V. *The more acute forms of streptococcus mastitis*, F. C. Minett, A. W. Stableforth, and S. J. Edwards.—The views of previous workers who have investigated mastitis and its clinical and bacteriological aspects are first discussed. This is followed by a history and the clinical symptoms shown by affected animals and a further history of three herds.

VI. *The non-haemolytic streptococci of bovine mastitis and their relationship to certain saprophytic streptococci from cattle*, S. J. Edwards.—A report is given of 107 strains of nonhemolytic streptococci isolated from 107 milk samples. By cultural and biochemical examination these strains were found to fall into four groups.

The piroplasmoses of bovines in Turkey [trans. title], F. Lestoquard (*Bul. Soc. Path. Exot., 24 (1931), No. 9, pp. 817–819*).—The author reports that in Anatolia bovines may be infected by *Piroplasma bigeminum*, *Babesiella berbera*, *Theileria mutans*, *T. dispar*, and *Anaplasma marginale*, the forms of Piroplasmidae most widespread in the Mediterranean Basin.

The cause of caseous lymphadenitis of sheep in Australia, H. R. Carne and R. C. Cramp (*Aust. Vet. Jour., 8 (1932), No. 1, pp. 28–33*).—Bacteriological examination of 62 lesions of caseous lymphadenitis in Australian sheep resulted in *Corynebacterium ovis* (bacillus of Preisz-Nocard) being demonstrated in pure culture in 60 instances, 2 lesions being found sterile. It is concluded that this disease of sheep in Australia is due to pure infections with *C. ovis*. A list is given of 29 references to the literature.

***Infectious entero-toxaemia (the so-called braxy-like disease) of sheep* in Western Australia**, H. W. Bennetts (*Aust. Council Sci. and Indus. Research Bul. 57 (1932), pp. 72, figs. 12*).—This is a detailed report of the author's studies of the braxy-like disease, also known as Beverley disease. This was first reported in 1915 affecting sheep in Western Australia, where it is responsible for very serious economic losses.

Following a brief introduction, a general description is given of the disease, followed by reports of bacteriological investigations, experimental reproduction, etiology, differential diagnosis, immunity, and methods of control. The disease has been found to be an acute infectious toxemia of sheep due to the absorption of a bacterial toxin elaborated by a specific anaerobic bacillus during its active growth within the contents of the small bowel. "The causal organism is a new species of anaerobe which is differentiated from the closely allied species *B[acillus] welchii*, the lamb dysentery bacillus, and *B. paludis* by means of cross-immunity tests. The recent descriptions of these three new species of anaerobes emphasize the importance of such tests as specific diagnostic criteria for *B. welchii* and related anaerobes, possibly also for other species of organisms. The name *B. ovitoxicus* has been adopted for this organism.

"Factors responsible for the proliferation of *B. ovitoxicus* in the contents of the small intestine are discussed. Evidence is advanced in support of the opinion that stasis or sluggishness of the small bowel is a predisposing factor of prime importance. Close grazing of sheep over soils which are, presumably, heavily contaminated with *B. ovitoxicus* favors the incidence of the disease. More rarely trauma of the small bowel resulting from the ingestion of fruits of *Inula graveolens* (stinkwort) may lead to enzootics.

"Methods of control are indicated. These include suggestions as to flock management designed to counteract predisposing factors. Compulsory exercise and the supplementary feeding of fodders rich in fiber are recommended as stimulants to peristalsis. The destruction of carcasses and avoidance of close grazing would prevent the ingestion of massive amounts of the causal organism in contaminated soil. Losses during the summer months, when the disease does not normally occur, may be prevented by the avoidance of grazing on fruiting *I. graveolens* or dry peas under certain weather conditions. Because there is evidence that a natural immunity develops when the disease has been enzootic for some years, owners of affected properties are advised to breed as far as possible from their own flocks. Preliminary work on active immunization against *B. ovitoxicus* by means of anaculture has given very encouraging results."

The report is presented in connection with a list of 76 references to the literature, many of which have been previously noted.

"Pulpy kidney," or acute infectious entero-toxaemia of lambs due to B. ovitoxicus (Bennetts), D. T. Oxer (*Jour. Council Sci. and Indus. Research*

[*Aust.*], *5* (*1932*), *No. 1*, *pp. 25–27*).—These data, which include experimental observations, supplement the account by Bennetts above noted.

The large stomach worm of sheep: Control by means of carbon tetrachloride, I. C. Ross (*Jour. Council Sci. and Indus. Research* [*Aust.*], *4* (*1931*), *No. 4*, *pp. 217–220*).—It was found that under dry conditions four treatments with carbon tetrachloride at monthly intervals were almost completely effective in eliminating *Haemonchus contortus* from a flock of 50 sheep, as determined by repeated fecal examination and post-mortem findings in a small proportion of them. "While the simultaneous consumption of sodium arsenite and copper sulfate in the lick may have contributed to the results, it is not considered that these drugs were of material importance. Although sheep receiving medicated lick containing sodium arsenite and copper sulfate had a lower average infestation than control untreated sheep, nevertheless the results obtained were not considered conclusive. The sheep receiving tetrachlorethylene in the drinking water had also fewer worms than the controls. Results again were not conclusive. Given prolonged dry conditions, it is concluded that regular monthly treatment with carbon tetrachloride in 2-c c doses may be expected to effect eradication of *H. contortus* in 5 or 6 months."

Note on the treatment of lung worm, Dictyocaulus filaria (Rud., 1809), infestation of sheep, G. Kauzal (*Aust. Vet. Jour.*, *8* (*1932*), *No. 1*, *pp. 25–28*).—In a series of 10 sheep exposed to artificial infestation with *D. filaria*, symptoms of considerable infestation were obtained in the majority. A single treatment of heavily infested sheep, either by insufflation or by intratracheal injection with carbon tetrachloride and tetrachlorethylene or by intratracheal injections of 6 c c of a formula consisting of chloroform 0.5 c c, creosote 0.5 c c, oil of turpentine 1 c c, and olive oil 2 c c did not remove all the worms in any case. Indications were obtained, however, that possibly treatment removed a proportion of the worms present, if the number found after treatment be compared with that in untreated control animals. The number of animals was too small to allow of any useful estimate of the relative value of the treatments used. Intratracheal injections with carbon tetrachloride proved very dangerous, but insufflation produced no obvious ill effects. In a further series of sheep exposed to artificial infestation, a marked degree of resistance to infestation was shown.

It is considered that, in determining the effects of treatment in lungworm infestation, either a very large number of naturally infested animals must be employed or the degree of infestation carefully determined beforehand by the demonstration of larvae in the feces. Even where animals are exposed to artificial infestation, the demonstration of larvae is necessary.

Parasitological field trials with sheep: Results at "Gundowringa," New South Wales, and "Frodsley," Tasmania, I. C. Ross and N. P. Graham (*Jour. Council Sci. and Indus. Research* [*Aust.*], *5* (*1932*), *No. 1*, *pp. 31–39*).—"Routine monthly treatment with copper sulfate, sodium arsenite, and copper sulfate, or carbon tetrachloride alone, greatly decreased mortality caused primarily by small trichostrongyles, though no suggestion was obtained that eradication could be achieved by such measures. Treated sheep cut from 0.5 to 1.5 lbs. of wool per head more than untreated, and showed much greater gain in weight. While the administration of certain drugs in the form of licks appeared to lessen the degree of infestation with large bowel worms [*Oesophagostomum venulosum* and *Chabertia ovina*], this requires confirmation before any opinion is formed."

A study of the efficiency of the different methods for controlling stomach and intestinal worms in sheep and goats, P. C. Boncato (*Philippine*

Agr., 20 (1932), No. 10, pp. 669–677).—In the heavily infested sheep and goat flocks of the College of Agriculture, University of the Philippines, the helminths detected included the stomach worm (*Haemonchus contortus*), nodular worm (*Oesophagostomum columbianum*), hookworm (*Bunostomum* spp.), and tapeworm (*Moniezia expansa*).

In control work, animals given a mixture of grain in the proportion of eight parts, by weight, of shelled corn, five parts of copra meal, and one part of rice bran in an amount that the animals would clean up readily every evening showed the best results in promoting good health and in reducing the parasitic infestation of the animals. Copper sulfate solution in the doses used, administered to goats and sheep at weekly and 21-day intervals, was not as satisfactory as grain feeding in reducing the degree of infestation of the animals. Under unfavorable conditions, this anthelmintic is not very effective in controlling losses from the attack of internal parasites. Neither did the copper sulfate-nicotine solution of the doses employed and in the frequency of treatment followed give as good results as grain feeding in lowering the degree of infestation of goats and sheep and in preventing losses from the parasites. On the basis of egg count of parasites in the feces, both copper sulfate and copper sulfate-nicotine solutions had similar effects in reducing the degree of infestation of sheep and goats.

The use of carbon tetrachloride in the treatment of kidney worm infestation in the pig, G. Kauzal (*Aust. Vet. Jour.*, 8 (1932), No. 2, pp. 68, 69).—Experiments in which two pigs were treated with carbon tetrachloride, although not conclusive, suggest that it may have some selective action on the kidney worm (*Stephanurus dentatus*) while it is present in the liver. It is pointed out that the tolerance of the pig to carbon tetrachloride is not high.

Brucella infection in the horse [trans. title], J. van der Hoeden (*Tijdschr. Diergeneesk.*, 59 (1932), No. 9, pp. 612–620, figs. 2; Ger., Eng., Fr. abs., pp. 619, 620).—It was found that the administration of a killed Brucella culture by mouth did not result in the formation of agglutinins or amboceptors in the horse. The oral administration of living Brucella culture quickly produced agglutinins and complement fixing antibodies. The subcutaneous injection of a killed Brucella suspension was found to set up an allergic reaction in horses affected with brucellosis, including a fever of two days' duration, swelling, and as a rule, abscess formation at the place of injection. The ophthalmic test with a preparation of Brucella was negative in 23 noninfected horses and clearly positive in the 7 horses affected with brucellosis.

Report of the poultry pathologist, F. R. Beaudette et al. (*New Jersey Stas. Rpt. 1931*, pp. 332–344).—The work in poultry pathology at the New Brunswick laboratory is reported by Beaudette, the geographic distribution of diseases based upon 1,583 birds found on 631 farms being given in tabular form, followed by an account of experimental work with infectious bronchitis and notes on a study of poultry diseases in New Jersey. The work at the South Jersey laboratory, including a study of 2,082 specimens originating from 900 farms, is reported upon by J. J. Black, the details being given in tabular form. Notes on the use of pigeon pox vaccine, pigeon paratyphoid, etc., are included.

An inquiry into the influence of environment upon poultry morbidity (*Nebraska Sta. Rpt.* [1931], pp. 9–11).—Results of studies of the epizootologic behavior of blackhead and fowl cholera are briefly reported.

Organisms of the B. influenzae group in fowls, C. A. McGaughey (*Jour. Compar. Path. and Ther.*, 45 (1932), No. 1, pp. 58–66).—From the studies reported the author considers it probable that bacteria of the influenza group are not infrequently present in the upper respiratory tract of normal fowls.

On the different forms of catarrh in poultry, V. S. GRABOVSKY (*Vet. Jour.,* *88 (1932), No. 3, pp. 118–121*).—Four forms of catarrh of poultry are described, namely, a simple catarrh (colds), contagious nasal catarrh, nutritional roup, and an oculonasal form of fowl pox.

Fowl-pox, A. BROERMAN and B. H EDGINGTON (*Ohio Sta. Spec. Circ. 37* *(1932), pp. 11, figs. 2*).—This is a practical summary of information on fowl pox, particularly as relates to means of control. Referring to pigeon pox virus as the source of vaccine for fowl pox, it is stated that the station has found upon the application of a 1 per cent suspension of the powdered scabs by the stick and one-feather follicle methods that most fowls were not immune when exposed three months later to severe artificial infection with fowl pox virus, although birds vaccinated in a similar way with fowl pox virus and exposed in the same manner proved to be immune. Again, 60 per cent of the fowls vaccinated with pigeon pox virus by the same methods contracted the disease four months later when placed in contact with the affected fowls. It is pointed out that the one-feather follicle method was slightly more efficient than the stick method in protecting fowls, and that probably the immunity following the use of the pigeon pox vaccine would have been of longer duration if more feather follicles had been employed in the vaccination.

Results of experiments with the use of pigeon-pox virus as cutaneous vaccine against fowl-pox, E. P. JOHNSON (*Poultry Sci., 11 (1932), No. 3, pp. 187–190*).—It is concluded from experiments conducted at the Virginia Experiment Station that pigeon pox virus vaccine, a description of which is given, is a very satisfactory immunizing product for prevention of natural infection of fowl pox with no disastrous sequelae as frequently are encountered following the use of the causative virus as vaccine.

Vaccinating against fowl pox, F. R. BEAUDETTE (*New Jersey Stas. Hints to Poultrymen, 20 (1932), No. 8, pp. 4*).—A brief practical account.

Inheritance of resistance to fowl paralysis (neurolymphomatosis gallinarum).—II, On a significant difference in the incidence of fowl paralysis in two groups of chicks, J. BIELY, E. PALMER, and V. S. ASMUNDSON (*Canad. Jour. Research, 6 (1932), No. 4, pp. 374–380, pl. 1*).—In this second contribution (E. S. R., 67, p. 321) data are presented on two groups of 30 chicks each, hatched from a susceptible and an apparently resistant flock. There was a significant difference in the incidence of fowl paralysis and lymphomatous tumors in these two groups. This is interpreted to mean that there is an inherent difference in susceptibility and resistance to fowl paralysis and lymphomatous tumors.

Comparison of efficiency of the rapid whole blood agglutination test with the serum agglutination test for pullorum disease, J. BIELY and W. ROACH (*Canad. Jour. Research, 6 (1932), No. 4, pp. 381–386*).—The results obtained in the field by the authors with the rapid whole blood agglutination test for pullorum disease agreed closely with the results secured with the rapid serum agglutination test when applied in the laboratory. "The accuracy of the diagnosis was found to depend upon the training and experience of the technician. When the whole blood agglutination test was applied by inexperienced persons, the results obtained differed from the laboratory test by 12 per cent as compared with a difference of 1.3 per cent when the whole blood agglutination test was applied by an experienced technician. The rapid whole blood agglutination test was found to lend itself very readily to practical application in the field. The extremely low cost makes feasible the application and repetition of the test on a large scale. Since it is known from previous

work that one agglutination test will not eliminate all carriers of pullorum disease, the rapid whole blood agglutination test should be applied several times a year until at least two successive negative tests are obtained on each bird of the flock."

Mortality in ninety-six groups of chicks in which pullorum disease occurred, C. M. HAMILTON (*Poultry Sci., 11 (1932), No. 3, pp. 185, 186*).—It is concluded from studies at the Western Washington Experiment Station that the 26 per cent mortality experienced during the first three weeks' brooding in 96 groups of chicks in which chicks were found to be infected with *Salmonella pullorum* was heavier than the mortality in a limited number of groups of chicks in which brooding trouble was encountered but which were apparently free from pullorum disease.

***Report of First European Conference of Experts in Poultry Diseases*, Hanover, October 23 and 24, 1931** [trans. title], MIESSNER, TE HENNEPE, BEROK, and SCHÜTT (*Deut. Tierärztl. Wchnschr., 40 (1932), No. 5, pp. 33–39, figs. 2; abs. in Vet. Rec., 12 (1932), No. 21, p. 591*).—This conference, attended by 26 avian pathologists and devoted entirely to pullorum infection in the fowl, resulted in the drawing up of a program for investigation of a more suitable technic for the detection of carrier birds.

Investigations concerning poultry typhus and white diarrhoea in chickens, P. I. STENIUS (*Vet. Jour., 88 (1932), No. 3, pp. 107–118*).—This is a report of bacteriological studies conducted in Finland in which tables are included showing the gas and acid-producing qualities of 10 different pullorum strains in different kinds of sugar; the serum titer in the cases of 19 birds reacting to the pullorum disease, with the result of the pathologic anatomic and bacteriological investigations; agglutination results (serum rapid method) on examination of poultry at the occurrence of agglutinated particles in the blood at different periods; agglutinative capacity of a number of different pullorum sera; and agglutination results according to the serum rapid method and the Dorset method.

Studies on an acquired resistance of chickens to the nematode Ascaridia lineata (Schneider), G. L. GRAHAM, J. E. ACKERT, and R. W. JONES (*Amer. Jour. Hyg., 15 (1932), No. 3, pp. 726–740*).—In a series of experiments at the Kansas Experiment Station involving 677 White Leghorn chickens, the authors have found evidence of an acquired resistance of chickens to the nematode *A. lineata*. "Comparisons of data showing statistical significance were indicative of an acquired resistance, and those which were not biometrically significant tended to support this finding. The boring proclivity of the young *A. lineata* places them in intimate contact with the serous fluids of the intestinal wall, where they probably give off metabolic proteins which engender antibody formation. This immunity or resistance apparently is reduced in degree by the accumulation of excessive amounts of these antigenic substances due to the continued presence of worms in the intestine.

"The results of an experiment involving the administration of carbon tetrachloride as an anthelmintic indicated that the growth of the young *A. lineata* was retarded by indirect action of the drug. The retardation was attributed to the combination of the ionized blood calcium with the bile pigments resulting from the liver injury due to the carbon tetrachloride. In another experiment in which an excess of calcium was supplied in the diet of the chickens, no retardation of worm growth occurred. The progressively shorter mean lengths of young *A. lineata* from groups of chickens parasitized at 4, 5, and 6½ weeks, respectively, are attributed to age resistance of the hosts."

A list is given of 27 references to the literature.

A cholera-like disease in turkeys, H. M. De Volt and C. R. Davis (*Cornell Vet., 22 (1932), No. 1, pp. 78–80*).—The authors report upon an outbreak of disease in a flock of 175 turkeys in Maryland that corresponded closely to fowl cholera. There was a mortality of 17 per cent of the original flock before losses ceased.

The helminth parasites of deer (*Jour. Helminthol., 9 (1931), No. 4, pp. 217–248*).—A list is given of the trematodes, cestodes, and nematodes which parasitize deer and a host list of parasites with notes, together with a four-page list of references to the literature.

On the longevity of Fasciola hepatica in experimentally infected rabbits, R. F. Montgomerie (*Jour. Helminthol., 9 (1931), No. 4, pp. 209–212*).—An account is given of three rabbits that remained infested with *F. hepatica* for more than one year, one for a period of three years and one month. This is thought to be the first record of long continued infestation of rabbits with the liver fluke.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations at the California Station] (*California Sta. Rpt. 1931, pp. 50–53, 81, 82*).—The progress results are very briefly presented of studies on farm septic tanks, use of electricity for soil heating, steam sterilization of dairy utensils, casein-manufacturing machinery, a portable-type ice-refrigerated milk-cooling unit, temperature lags in adobe houses, equipment for alfalfa aphis control by burning, grape and cotton irrigation, water losses in rice irrigation, and irrigation requirements of and methods of applying water to citrus fruits.

[Agricultural engineering investigations at the Indiana Station] (*Indiana Sta. Rpt. 1931, pp. 6–9, figs. 2*).—The progress results are presented on studies of plow coverage and picker losses in corn production, a new belt transmission dynamometer, a hot air drying machine, drying corn in the crib, the combined harvester-thresher, soil erosion, apple storage, poultry house heating and ventilation, threshing with electric power, use of electric current in brooding chicks, and power consumption in stationary method of spraying.

[Agricultural engineering investigations at the New Jersey Stations] (*New Jersey Stas. Rpt. 1931, pp. 13–15, 61–63, 377–384, figs. 9*).—The progress results are presented of studies on mechanical means of projecting air for dusting, effects of automatic turning and positioning of eggs during incubation, tillage machinery, water supplies and sewage disposal, and sewage irrigation.

Surface water supply of the United States, 1929, III, XII A (*U. S. Geol. Survey, Water-Supply Papers 683 (1932), pp. VIII+272, fig. 1; 692 (1932), pp. VII+190, fig. 1*).—Of the papers which here present the results of measurements of flow made on streams during the year ended September 30, 1929, No. 683, prepared in cooperation with the States of New York, West Virginia, Ohio, North Carolina, Virginia, and Tennessee, covers the Ohio River Basin; and No. 692, prepared in cooperation with the States of Washington, Montana, and Idaho, the Pacific slope basins in Washington and upper Columbia River Basin.

Surface water supply of the United States, 1930, Parts 1, 6, 7, 11, 12 B (*U. S. Geol. Survey, Water-Supply Papers 696 (1932), pp. VIII+286, fig. 1; 701 (1932), pp. IX+302, fig. 1; 702 (1932), pp. V+115, fig. 1; 706 (1932), pp. IX+317, fig. 1; 708 (1932), pp. VI+191, fig. 1*).—Of the papers which here present the results of measurements of flow made on streams during the year ended September 30, 1930, No. 696, prepared in cooperation with the States of

Maine, New Hampshire, Vermont, Massachusetts, Connecticut, New York, New Jersey, Maryland, West Virginia, and Virginia, covers the North Atlantic slope drainage basins; No. 701, prepared in cooperation with the States of Montana, Wyoming, Missouri, and Kansas, the Missouri River Basin; No. 702, prepared in cooperation with the States of Missouri, Tennessee, Arkansas, Kansas, and Texas, the lower Mississippi River Basin; No. 706, prepared in cooperation with the States of California and Oregon, the Pacific slope basins in California; and No. 708, prepared in cooperation with the States of Idaho, Oregon, Nevada, and Washington, the Snake River Basin.

Streamflow from rainfall by unit-graph method, L. K. Sherman (*Engin. News-Rec., 108 (1932), No. 14, pp. 501–505, figs. 7*).—A method is described whereby the observed run-off following an isolated 1-day rainfall forms the basis for computing the run-off history for the same watershed corresponding to a rainfall of any duration or degree of intensity. From the known hydrograph the unit graph must be determined, representing 1 in. of run-off from a 24-hour rainfall. The daily ordinates of the unit graph can then be combined in accordance with the variation in daily precipitation figures so as to show the run-off from a storm of any length.

Head loss in flow through fine screens, M. R. Lewis (*Agr. Engin., 13 (1932), No. 6, p. 144, fig. 1*).—A brief report is presented of studies conducted by the U. S. D. A. Bureau of Agricultural Engineering in cooperation with the Oregon Experiment Station, the purpose being to develop methods of screening out weed seeds from irrigation water. Tests on three screens of varying mesh size showed that the loss of head through the screen follows the usual orifice law represented by the formula, $Q=CA\sqrt{2gh}$. The data are presented graphically.

Parshall flumes of large size, R. L. Parshall (*Colorado Sta. Bul. 386 (1932) pp. 55, figs. 28*).—This report brings together information and experimental data gathered under a cooperative agreement with the U. S. D. A. Bureau of Agricultural Engineering.

The data indicate that this measuring flume is accurate enough to meet practical irrigation requirements under conditions where sand and silt have given trouble in the old type of rating flume. The range of capacity extends from less than 0.1 sec.-ft. for the 3-in. flume to more than 2,000 sec.-ft. for the 40-ft. flume. The successful operation of the flume depends largely upon the correct setting of the elevation of the crest above the grade of the channel and on precise construction to correct dimensions. It is recommended that these flumes be built in straight canal sections.

Data of a technical character are presented on the design of flumes for special conditions.

Cost of pumping for irrigation in Colorado, with data, W. E. Code (*Colorado Sta. Bul. 388 (1932), pp. 69, figs. 13*).—This bulletin presents additional results of a special study of the cost of pumping for irrigation covering the two years 1929 and 1930 under conditions that were representative of practice in the northern and southern parts of Colorado (E. S. R., 67, p. 173).

Although direct comparisons could not be made fairly, in general it appears that electric pumping by means of a properly proportioned plant on the ordinary sized farm of between 80 and 160 acres will prove as cheap a means as any for providing irrigation water.

[Drainage investigations at the Florida Station] (*Florida Sta. Rpt. 1931, pp. 128–131, 153, 154, fig. 1*).—The progress results of drainage investigations in the Everglades are reported, special reference being made to the measurement of water table conditions.

The cost of drainage pumping, J. G. SUTTON (*Agr. Engin., 13 (1932), No. 5, pp. 123, 124, figs. 2*).—In a contribution from the U. S. D. A. Bureau of Agricultural Engineering, data are presented and discussed on methods of computing costs of drainage pumping and factors that affect the cost. Data also are presented on the operation of the pumping plants of 16 representative drainage districts.

Little difference was found in the average cost of pumping with oil engines, electricity, and the most efficient steam plants. However, the minimum costs were obtained on a simply constructed semi-Diesel plant. Electric power averaged 58 per cent of the total cost of operation of the electric plants. Coal was the largest item in the cost of operation of the steam plants, averaging 42 per cent of the total. Fixed charges of interest and depreciation constituted the largest item in the expense of oil-engine plants, averaging 43 per cent of the total costs. The fuel oil for this class of plants amounted to only 17 per cent of the total costs.

Moisture relationships of soils in situ, J. H. NEAL (*Agr. Engin., 13 (1932), No. 5, pp. 128–132, figs. 5*).—Results are reported of studies conducted at the Minnesota Experiment Station which dealt with the moisture properties of soils in their undisturbed natural position and the relationship thereof to the drainage of these soils. For this purpose 15 sets of 6-in. cubes were taken at alternate 6-in. intervals to a depth of 4 ft. Each set of samples was taken about 10 ft. from a tile line, which was far enough away to secure undisturbed soil.

The observations included moisture content as taken in the field, after submergence in water for 48 hours, and after draining 48 hours following submergence. The decrease in volume upon drying also was measured, together with the weight per cubic foot. Determinations also were made of moisture equivalents on disturbed samples.

The moisture content of the saturated mineral soils and their pore space showed a fairly definite relationship to the moisture equivalent. The moisture content of moderately fine-textured soils in situ lying below the water table varied between 1 and 1.4 times the moisture equivalent, while that for the coarser textured soils exceeded 5 times the moisture equivalent. Free drainage of small detached soil masses that had been saturated with water caused very little loss, with the result that their final moisture content was far in excess of that of soils in capillary connection with the earth's soil mass.

It is concluded that since the moisture equivalent represents the approximate normal water-holding capacity of the fine-textured soils, the amount of irrigation water applied should not exceed this amount for the root zone. In the case of the coarser textured soils, the normal water-holding capacity is from 1.5 to 3 times the water content at the moisture equivalent, the ratio becoming higher as the soil becomes coarser. The further conclusion is drawn that only the water in excess of the normal water capacity is free to move to drains or to the deep subsoil.

A list of 11 references is included.

Soil erosion control in Illinois, E. W. LEHMANN (*Agr. Engin., 13 (1932), No. 5, pp. 126–127, fig. 1*).—In a contribution from the Illinois Experiment Station a brief summary is presented of the results of soil erosion control investigations, and some of the more practical aspects of the findings are discussed.

Recent research on the influence of forests in checking erosion and surface run-off, S. CABIANCA ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Sci. and Pract. [Rome], 23 (1932), No. 1, pp. 25–35*).—A summary of investigations by others bearing on the subject is presented under the headings of evolution of land reliefs, retention of water by the soil, evaporation, control of run-off and stream flow, and erosion. A list of 20 references is included.

Public Roads, [June, 1932] (*U. S. Dept. Agr., Public Roads, 13 (1932), No. 4, pp. 57–72+[2], figs. 21*).—This number of this periodical contains the current status of Federal-aid road construction as of May 31, 1932, data on gasoline taxes, 1931, and the following articles: Stabilization by Drainage of Muck and Sand Fill, by C. A. Hogentogler and E. A. Willis (pp. 57–63, 72); and The Segregation of Water in Concrete Placed in Deep Forms, by F. H. Jackson and W. F. Kellermann (pp. 64–69, 72).

Economics of highway bridge types, C. B. McCullough (*Chicago: Gillette Pub. Co., 1929, pp. X+246, figs. 193*).—This volume presents a concise discussion of the fundamentals of economic analysis and type selection for ordinary highway bridge structures. It contains chapters on general factors controlling type selection, fundamentals of economic analysis, bridge types, renewal and maintenance costs, unit costs, and illustrative problems in type selection.

The nail-holding power of the principal Philippine commercial woods, J. C. Espinosa (*Philippine Jour. Sci., 47 (1932), No. 4, pp. 425–431, pls. 2, fig. 1*).—In a contribution from the Bureau of Science of Manila, the results of studies are reported which show that it is safe to assume that the nail-holding power of Philippine woods is closely related to the specific gravity, that is, the denser the wood the higher is the nail-holding power. The amount of displacement due to a unit pull was found to have no relation to the specific gravity. Among the important species of high nail-holding power special mention is made of manggachapui.

Binding twine investigations [trans. title], H. R. Schacht (*K. Vet. og Landbohøjskole [Denmark], Aarsskr. 1928, pp. 56–75, figs. 7; Ger. abs., pp. 73–75*).—Tests of Danish binding twine for use in binding grain and baling straw are reported, special attention being given to length of strands, resistance to wear, stretching ability, and regularity of twist as compared to foreign twines.

No difference was observed in the utility of cross and cylindrically wound spools of twine, although it is noted that the cylindrically wound twine gave better mechanical test results. The test data are subjected to analysis but no conclusions are drawn.

Measurement of spectral energy distribution for agricultural research, H. Miller (*Agr. Engin., 13 (1932), No. 5, pp. 125, 126, fig. 1*).—In a contribution from the Idaho Experiment Station data are presented on the measurement of the intensity and type of light in plant and animal production. An apparatus is described which makes it possible to measure light intensities being studied for the effect of various parts of the spectrum on plants and animals.

Heating water by solar energy, A. Carnes (*Agr. Engin., 13 (1932), No. 6, pp. 156–159, figs. 5*).—Results of studies conducted at the Alabama Experiment Station on heating water with solar energy for dairy purposes are reported. It was found that the solar heater offers a practical means of supplying water for dairy purposes, but for continuous service should have an auxiliary electric, oil, or gas heater.

It was found possible under favorable conditions to store from 58 to 84 per cent of the available solar energy. The storage tank and absorber box should be well insulated against heat loss, and the absorber should be covered with glass. The inside of the absorber box and the surface of the absorber should be painted a dull black. The absorber should be set at an angle of 46° with the horizontal in a latitude the same as Montgomery, Ala. A circulating pump placed between the storage tank and the absorber was found to increase the heat gradient, which in turn increases the rate of absorption.

A solar absorber constructed by soldering copper tubing in the valleys of corrugated roofing gave the best results of the absorbers test. It also was

found that when absorbers are constructed of pipe, fins up to a certain width will add to the rate of absorption. When fins are made of 28-gage sheet steel, they should be 0.5 in. wide.

Utilization of electrical energy in agriculture, H. CHAMPIGNY (*Utilisation de l'Énergie Électrique en Agriculture. Paris: Chemin de Fer de Paris à Orléans, 1929, 3. ed., pp. 88, figs. 35*).—This is an illustrated treatise describing the practical phases and features of rural electrification in France. It deals especially with the construction and maintenance of power lines, small belt power and other uses of electricity, including field plowing, and with financing and desirable legislation.

The practical electrical illumination of plants and the cost [trans. title], S. ODÉN, G. KÖHLER, and G. NILSSON (*Meddel. Centralanst. Försöksv. Jordbruksområdet [Sweden], No. 393 (1931), pp. 53, figs. 23; Ger. abs., pp. 49–52*).—The results of experiments on the technical adaptation of artificial electrical illumination for plant culture during the three winter months are reported. Particular attention was devoted to determining the most useful and economical sources and arrangement of light for greenhouses and hotbeds. Three different types of greenhouse were experimented with, including small, low but relatively broad houses, with middle aisle and low side beds; large relatively broad houses with high beds in the middle, as well as along the side, and aisles along both sides of the middle beds; and large houses with relatively low side walls and center and side beds.

Lighting periods of 500, 1,000, 1,500, and 2,000 hours per year and three different light intensities in two different lengths of house were studied. The cost of illumination from arc lamps was less than from gas-filled incandescent lamps as regards current consumption, but the cost of installation and maintenance was about 25 per cent higher. The higher the current rate the more favorable were the cost results with arc lights. The arc lamps also presented the difficulty of nonuniform illumination, which was not nearly so marked with the gas-filled incandescent lamps.

The best yield results were obtained with spinach in the first type of greenhouse illuminated with a row of show window lights set under the roof ridge on one side of the beds. The lamps were spaced one-fourth of the distance between the lamps and the beds. Good yield increases were obtained from the other types of greenhouse over houses not illuminated. In the second type a row of tin reflectors was placed under the roof ridge, these being supplemented by similar reflectors in the corners between the roof and side wall. The lamps were spaced 0.4 to 0.5 times the distance between the surface of the bed and the lamps. In the third type of house a row of lights was set under the roof ridge in opal glass cylinders, and flat enamel reflectors were used. The lamps were spaced 1 to 1.5 times the distance between the beds and the lamps, and the width of the house was limited to 2.8 times this distance.

Electric ploughing (*Rural Electrif. and Electro-Farming, 7 (1932), No. 82, pp. 300–302, fig. 1*).—A brief review is presented of the progress made in electric plowing in Europe, and the conclusion is drawn that the status of this practice justifies further consideration of its adaptation to farm work.

Charcoal-gas fuel for tractors, A. H. E. MCDONALD (*Agr. Gaz. N. S. Wales, 43 (1932), No. 2, pp. 135, 136, fig. 1*).—The use of charcoal gas in tractors is briefly described and the results of a power test reported. In a comparison of kerosene with charcoal gas in general-purpose tractors drawing four-furrow disk plows in clay loam soil, the charcoal-gas fuel accomplished about the same result as kerosene at a considerably lower cost.

Sugar beet machinery development, E. M. Mervine (*Agr. Engin., 13 (1932), No. 5, pp. 120–122, figs. 4*).—This is a preliminary report of investigations in progress by the U. S. D. A. Bureau of Agricultural Engineering.

The results indicate that labor requirements for blocking and thinning may be decreased by approximately 40 per cent. The ability of the mechanical harvester to take the place of many hand laborers and to do work of an equal or superior quality also was demonstrated. It was possible by mathematical calculations, based on probability and chance, coupled with an experimentally determined correction factor, to set the cross-blocking cultivator shovels to give the desired stand of beets. It was found that mechanical blocking is less injurious to small seedlings. The progress results of the work on the development of harvesting machinery also are briefly presented.

Effect of machine method on stand of cotton, D. G. Carter and E. B. Whitaker (*Agr. Engin., 13 (1932), No. 5, p. 119*).—A brief report contributed by the Arkansas Experiment Station indicates that production with large machines and large power units had no adverse effects on stands of cotton in one year's study. There was no correlation between yield, machine method, or stand. There were no significant differences in stand loss, indicating that 4-mule and tractor power and large capacity machines did not cause a loss in stand.

A new procedure for the destruction of weeds [trans. title], G. Carré (*Jour. Agr. Prat., 96 (1932), No. 7, pp. 134–136, figs. 3*).—In a contribution from the French Academy of Agriculture, a new mechanical method for the destruction of weeds in growing grain by the spraying thereon of a solution of a dilute sulfuric acid is described and illustrated. The machine consists essentially of a shoe, passing between the rows of growing grain at a height of from 15 to 30 cm, which covers a nozzle which in turn supplies the acid on the roots of weeds between the grain rows.

The best results were obtained when the spray was applied at a height of 15 cm. In spring grain a 20 per cent solution of sulfuric acid gave the best results, and a 30 per cent solution gave the best results in fall grain, in both instances the application being from 400 to 500 l per hectare. When the shoe was regulated to the height of 15 cm a minimum injury to the growing grain resulted.

Grain elevating machinery for the Palouse country, H. L. Garver (*Washington Col. Sta. Bul. 262 (1932), pp. 34, figs. 20*).—This is one of a series of bulletins dealing with the use of electricity on the farm and is the result of studies conducted by the station in cooperation with the Washington Committee on the Relation of Electricity to Agriculture.

It was found that the power requirements of some types of elevators are much greater than those of others, yet the cost of energy for the operation of any of these outfits is so small compared with the cost of manual labor that it seems extravagant to do the work by hand. The cracking of the grain did not result in changing the grade. The reduction in percentage of germination was not positive enough to justify discrimination against the pneumatic elevator in view of its other advantages.

Other practical information on the selection and installation of elevating equipment is presented.

The artificial drying of forage crops, O. Schnellbach ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Sci. and Pract.* [*Rome*], *22 (1931), No. 11, pp. 436–438*).—In a contribution from the Imperial Curatory for Agricultural Technology a summary is given of results of studies from various sources on the artificial drying of forage crops. It is pointed out that driers used only as a protection against bad weather can not be profitable.

Walnut dehydraters: Characteristics, heat sources, and relative costs, P. F. NICHOLS, B. D. MOSES, and D. S. GLENN (*California Sta. Bul. 531 (1932), pp. 34, figs. 15*).—Two studies of thermal efficiency and comparative cost factors in five types of walnut-dehydrating plants are reported as conducted by the station in cooperation with the California Committee on the Relation of Electricity to Agriculture.

The total operating costs for all tests averaged $3.43 per dried ton, the overhead costs adjusted to normal operating capacity $3.61, and the total costs $7.15. The corresponding costs averaged $2.23, $3.44, and $5.89, in gas-heated plants, $3.04, $4.57, and $7.61 in oil-heated plants, and $4.86, $3.47, and $8.33 in electrically heated plants.

The investment in dehydraters, exclusive of buildings, mechanical hullers, washers, and other accessory equipment, was found to vary from $750 to $2,000 per dry ton average daily capacity.

The thermal efficiencies averaged lowest in gas-heated and highest in electrically heated plants. They averaged highest in plants using recirculation of air. Electric heat, in spite of its high efficiency, proved the most costly, although not so expensive as to be prohibitive in walnut dehydration where low energy rates may be obtained.

The moisture content of the dried nuts varied excessively. No satisfactory means for controlling this automatically have been developed, but possible means of control are suggested.

The construction and management of air-cooled storages with special reference to apples, R. E. MARSHALL (*Michigan Sta. Circ. 143 (1932), pp. 43, figs. 32*).—This bulletin brings together considerable data and information secured at the station relating to air-cooled storages for apples. It deals especially with mechanical refrigeration and the principles of air-cooled storage, and contains other sections dealing with the rate of ripening in air-cooled storage and cellar type v. above-ground storages. Practical information is also included on construction and materials, with particular reference to ventilation and equipment.

The trench silo, J. T. MCALISTER and C. W. STROMAN (*Clemson Agr. Col. S. C., Ext. Circ. 121 (1932), pp. 16, figs. 12*).—Practical information on the construction of trench silos is presented, together with numerous illustrations and working drawings.

Measurement of orchard heater smoke, F. A. BROOKS (*Agr. Engin., 13 (1932), No. 6, pp. 149–152, figs. 4*).—In a contribution from the California Experiment Station a description is given of the apparatus and procedure in the measurement of orchard heater smoke. Some typical results with improved laboratory apparatus are presented in graphic form and briefly discussed.

A new electric dairy utensil sterilizer, H. E. BESLEY (*Agr. Engin., 13 (1932), No. 6, pp. 141–143, figs. 7*).—In a contribution from the Maryland Experiment Station, a new electric dairy utensil sterilizer is described and illustrated which comprises a completely insulated box heated by electric space heaters. The heat is uniformly distributed by baffles which induce a circulation of heated air by creating a chimney effect. The data of the tests upon which the development of the apparatus is based are also presented and discussed. In the tests of the wattage required for a 4-can sterilizer, it was found that 2,000 w was necessary.

Construction and operation of electric brooders, J. E. DOUGHERTY and B. D. MOSES (*California Sta. Circ. 325 (1932), pp. 30, figs. 20*).—Practical information is given on the construction and operation of electric brooders, special attention being given to the nonglowing and the glowing or radiant types of

brooder. The circular supersedes Bulletin 441 (E. S. R., 58, p. 486) and was prepared in cooperation with the California Committee on the Relation of Electricity to Agriculture.

The New Jersey collapsible summer shelter, L. M. BLACK (*New Jersey Stas. Hints to Poultrymen, 20 (1932), No. 9, pp. 4, figs. 6*).—This shelter is described and illustrated. This is the last of this series of publications.

Plans and specifications for two types of trapnest, W. C. THOMPSON (*New Jersey Stas. Hints to Poultrymen, 20 (1932), No. 7, pp. 4, figs. 4*).—The plans presented are for the so-called Eno trap nest and the Connecticut trap nest as revised for New Jersey conditions. Brief specifications for these are included.

Farm building losses in Iowa due to wind, M. F. SCHWEERS (*Agr. Engin., 13 (1932), No. 5, pp. 117–119, figs. 5*).—In studies at the Iowa Experiment Station it was found that of a total insurance payment of $220,000 during 1930, over 60 per cent was on losses due to wind, which in many cases were the result of poor design or faulty construction. Many losses could be ascribed to the failure of the plate joint on the leeward side of the building.

Studies of the forces exerted by air movement showed that available formulas do not consider suction or lifting forces. It was found that decreased static pressure, or suction, acts over the greater portion of the exposed area of the building.

Tests of plate joints showed that this joint, when improperly braced, results in a large portion of building losses due to wind. Under average methods of bracing the plate joint the failure occurred at the purlin. The deflections were about the same under smaller loads, and it was not until some portion loosened that there was a marked change in the trend of the pressure curves. No advantage was found in using a long brace as compared with a short brace at the plate. Nailing of the rafter to the side of the stud resulted in the greatest strength and the greatest simplicity in construction.

AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY

Classified list of projects in agricultural economics and rural sociology, Federal bureaus, State agricultural experiment stations, and independent institutions, year ended June 30, 1931, compiled by B. YOUNGBLOOD (*U. S. Dept. Agr., Off. Expt. Stas., [1932], pp. [2]+157*).—Included are 286 research projects active during the year ended June 30, 1931, in the Bureau of Agricultural Economics, 4 in the Bureau of Home Economics, 500 in the State agricultural experiment stations, 1 in the Children's Bureau, U. S. Department of Labor, and 25 in independent institutions. The list is annotated to show the leaders, objectives, areas covered, dates of beginning and probable completion, and phases or percentages of work completed.

The list was compiled in cooperation with the Bureau of Agricultural Economics, the Advisory Committee on Social and Economic Research in Agriculture of the Social Science Research Council, and officers and specialists of Federal bureaus, State agricultural experiment stations, and independent research agencies.

[Investigations in agricultural economics at the Indiana Station, 1930–31] (*Indiana Sta. Rpt. 1931, pp. 32–36, 44, fig. 1*).—Brief summaries of results of studies are included as follows: A study of the carrying capacity cost and returns from pasture in southern Indiana; the average cost per acre, 1927–1929, of harvesting with combined harvester threshers and binder and small threshers; the number of work horses per farm, crop acres per horse and

per man, the number of livestock per 10 acres, and drawbar power costs per crop acre on 33 central Indiana farms on which general-purpose tractors were used; costs in 1930 of husking and cribbing corn by hand and with 1- and 2-row pickers; the average possible load of electricity usable per year on 50 electrified farms; the average volume of business handled, net profits, and loading margins on corn and oats of 35 grain elevators in the western part of the State and 43 in the eastern part; the farm layout in relation to fencing costs and farm organization; and studies of the importance of certain factors used in research and teaching in determining farm profits as shown by the records of 280 central Indiana farms, of the percentage of farms in the State operated entirely by mechanical power in 1930, of the marketing of tomatoes by grade, and of the sources of the potato supply of the State.

[Investigations in agricultural economics at the Maryland Station, 1930–31] (*Maryland Sta. Rpt. 1931, pp. XII, XIII, XVIII–XX*).—Brief reports are included showing (1) for 129 farms studied the acres cared for per laborer and the average size of field on farms of 50 acres and less and of 200 acres; (2) the total membership and the value of products marketed, supplies purchased, and products transported by the 43 cooperative farm organizations in the State; and (3) the average yield and the average cost per acre, 1925–1930, by items, of producing corn, corn silage, wheat, mixed hay, and soybean hay.

[Investigations in agricultural economics at the New Hampshire Station, 1931] (*New Hampshire Sta. Bul. 262 (1932), pp. 4–8*).—Results not previously noted are briefly reported on the production of corn silage and hay on 280 farms studied by M. F. Abell; and the costs of producing eggs and pullets and feed requirements for poultry on 23 farms studied by H. C. Woodworth and F. D. Reed.

[Investigations in agricultural economics at the New Jersey Stations, 1930–31], J. G. Lipman and A. G. Waller (*New Jersey Stas. Rpt. 1931, pp. 7–12, 95–101*).—Results not previously noted are reported for farm management business surveys on 48 Burlington County fruit and vegetable farms in 1929, 329 dairy farms in Hunterdon, Sussex, and Warren Counties in 1930, and 10 vegetable and truck crop farms in Monmouth County in 1928 and 1929; and for the average costs of production in 1930 of can-house and market tomatoes, sweet corn, potatoes, apples, peas, cucumbers, green peppers, and Lima beans.

[Investigations in agricultural economics at the Ohio Station], J. I. Falconer (*Ohio Sta. Bimo. Bul. 157 (1932), pp. 159, 160*).—A table is given showing, by years 1926–1932, the comparative prices per bushel of potatoes in Ohio, Michigan, Minnesota, and Maine. The table of index numbers of production, prices, and income (E. S. R., 67, p. 470) is brought down through April, 1932.

Proceedings of the National Conference on Land Utilization (*U. S. Dept. Agr., 1932, pp. IV+251, figs. 40*).—Included are the following papers presented at the conference called by the Secretary of Agriculture and the executive committee of the Association of Land-Grant Colleges and Universities and held at Chicago, Ill., November 19–21, 1931: The Agricultural Outlook and the Land Problem, by N. A. Olsen (pp. 3–17); The Place of Federal Reclamation in a Federal Land Policy, by E. Mead (pp. 17–23); Relation of Land Utilization to the General Objectives of the Federal Farm Board, by J. C. Stone (pp. 23–29); Developing a National Policy of Land Utilization, by A. M. Hyde (pp. 29–36); Land Utilization in the Western Range Country, by W. Peterson (pp. 38–47); Extent and Emergency Character of Problems of Submarginal Lands, by T. P. Cooper (pp. 47–53); New York's Land-Utilization Program, by C. E. Ladd (pp.

53–58); Some Ways of Dealing with the Problems of Submarginal Land, by L. C. Gray (pp. 58–67); Land Inventory as a Basis for Planning Land Utilization, by L. R. Schoenmann (pp. 67–70); What Methods Should be Employed to Take Submarginal Lands Out of Agricultural Production, by H. W. Mumford (pp. 70–73); National Economic and Social Objectives in Forest Policy, by R. Zon (pp. 77–83); Land Utilization and Conservation, by G. D. Pratt (pp. 83–88); Turning Submarginal Crop Lands Within the Farm to Wood-lot Uses, by J. Fowler (pp. 88–90); What Are the Possibilities of Private Forestation? by S. T. Dana (pp. 90–95); Fitting Forestry into a General Program of Land Utilization, by R. Y. Stuart (pp. 95–103); The Coordination of State and Federal Efforts in the Development of a Land-Utilization Program, by C. A. Cobb (pp. 103–106); Fiscal Problems of Local Communities Resulting from Changing Conditions of Land Utilization, by G. S. Wehrwein (pp. 111–117); Adjustments for Greater Economy in Local Public Expenditures, by J. C. Watson (pp. 118–123); Should Other Industries Help Bear the Financial Burden of Maintaining a Rural Civilization? by C. V. Gregory (pp. 123–126); Adjusting the Tax Burden to the Tax-Paying Ability of the Tax Bearer, by R. T. Ely (pp. 126–129); Redistribution of the Responsibility for Supporting Governmental Functions, by F. Brenckman (pp. 129–132); Changes in Taxation Requisite for a Sound Program of Land Utilization, by E. Englund (pp. 132–145); Some Ways of Relieving the Excessive Burden on Farm Land, by M. Graves (pp. 145–152); Soil Conservation a Major Problem of Agricultural Readjustment, by H. G. Knight (pp. 153–162); Soil Classification a Basis of Agricultural Adjustments, by J. G. Lipman (pp. 163–165); The Outlook a Basis for Adjustments in the Better Farming Areas, by H. R. Tolley (pp. 165–167); A Regional Approach to the Problems of Farm Adjustments, by C. L. Holmes (pp. 167–177); The Rôle of the Small Farm in Future Land Utilization in the United States, by J. D. Black (pp. 177–187); How Can Mechanization and Scientific Management Strengthen the Competitive Position of American Agriculture? by M. L. Wilson (pp. 187–194); Helping the Farmer Translate Economic Information into Action, by C. W. Warburton (pp. 194–200); Functions of Farm-Mortgage Agencies in Agricultural Readjustment, by S. J. Westbrook (pp. 202–209); The Management of Farm Lands Held by Credit Agencies, by E. S. Brigham (pp. 209–213); Some Problems in Financing Needed Readjustments in Land Utilization and Farm Organization, by N. J. Wall (pp. 213–225); Results of Directed Agricultural-Credit Movement—Georgia, 1931, by J. P. Campbell (pp. 225–229); Broadening the Market for Federal Intermediate Credit Bank Debentures, by E. H. Thomson (pp. 230–234); and Increasing the Usefulness of the Intermediate Credit System as a Supplement to the Country Bank, by W. Netherland (pp. 234–239).

The report of the committee on summaries and conclusions as adopted by the conference is given.

Economic utilization of marginal lands in Nicholas and Webster Counties, W. Va., M. Peck, B. Frank, and P. A. Eke (*U. S. Dept. Agr., Tech. Bul. 303 (1932), pp. 64, pls. 3, figs. 12*).—This study was made in cooperation with the West Virginia Experiment Station "to show which type of land should be used for agriculture and which for forestry and to try to point out the conditions that will determine whether land not easily classified as farm land or forest land should be used for a different type of farming or for a different combination of agriculture and forestry; [and] to indicate lines of improvement in the utilization of both farm and forest lands, and the relation of such changes in utilization to the social institutions of the area, particularly the schools and roads."

The geographic characteristics and the economic development and organization of the area are described. The differentiation of farm and other land, the

relationships of soil type and topography to farm economy, the effects of soil type, topography, and size of farm on farm income, the community as a factor in drawing the line between farm and other land, and the forestry aspects of the land utilization problem are discussed. An economic program is outlined for farming and forestry in the area.

Digest of forest tax laws in the United States in effect January 1, 1932, L. S. MURPHY, P. A. HERBERT, and W. E. DEVRIES (*U. S. Dept. Agr., Forest Serv., Forest Taxation Inq. Prog. Rpt. 16 (1932), pp. [5]+73, fig. 1*).—This is a revision of the digests previously noted (E. S. R., 63, p. 587).

Agricultural finance in South Carolina, D. L. WICKENS and W. C. JENSEN (*South Carolina Sta. Bul. 282 (1931), pp. 67, figs. 12*).—This study, made in cooperation with the U. S. D. A. Bureau of Agricultural Economics, describes and interprets the credit conditions found on 213 farms in the Piedmont, Sandhill, and the Coastal Plain areas of South Carolina. The data were obtained by interviews with and questionnaires from the 213 farmers, 20 merchants doing a credit business, and banks, agricultural credit corporations, and county officials. Analysis is made of the amounts, forms, purposes for which used, length of term, sources, costs of different kinds, and the security and risk of short-term credit. The credit institutions, relation of cost rate of credit to interest paid, factors affecting costs, delinquency as a test of risk, factors affecting the amount of credit used, and the possibilities of improving credit practices are discussed.

Economic efficiency of Texas country banks, V. P. LEE (*Texas Sta. Bul. 450 (1932), pp. 39, figs. 12*).—"The purpose of this study is to show the relation between volume of business and the economic efficiency of Texas country banks." The banks studied are classified on the basis of volume of deposits, ratio of deposits to assets, volume of capital, and size and number of banks per town. Analysis is made of (1) the capital stock, volume of deposits and their ratio to capital and surplus, and the number of banks per town of the 151 State and national banks liquidated and absorbed January, 1929, to January, 1931; (2) the volume of deposits and capital stock of banks failing from 1911 to 1930, inclusive; and (3) the gross earnings, expenses, and ratios of earning assets to net earnings and to bank investment in 154 national banks in Texas. The ratios of Texas banks and banks in other regions are compared.

The study showed that (1) in general the smaller the bank the higher the expenses per dollar of earning assets, the smaller the interest on deposits the higher the charge for loans, and the less earned on its investment the greater the risk of failure; (2) large banks are generally more efficient than small banks from the standpoint of both the stockholder and the community; (3) the large number of Texas banks too small for economic efficiency is due to the actual lack of business in many small, one-bank communities and to the slack methods of governmental supervising agencies in granting charters; and (4) Texas country banks seem to be less efficient than similar banks in the Chicago and Philadelphia Reserve Districts.

The following adjustments are suggested: (1) Voluntary liquidation or absorption of a large number of the smaller banking units, (2) prevention of the establishment of new banks in communities where they can not be adequately supported, and (3) more adequate protection to depositors, borrowers, and stockholders by State and national banking laws.

Farm profits and factors influencing farm profits on 98 dairy farms in Sussex County, A. G. WALLER and E. RAUCHENSTEIN (*New Jersey Stas. Bul. 542 (1932), pp. 39, figs. 2*).—This survey, made in January and February, 1931, in cooperation with the Bureau of Agricultural Economics, U. S. D. A., covers

the year 1930. The changes in the agriculture of the county since 1880, the 1930 farm prices compared with previous years, the weather in 1930, the details of the farm business of the 98 farms and of 7 of the farms with labor incomes above the average are discussed. Analysis is made of the factors affecting cost of producing milk and the relation of labor income to certain farm business factors. Comparisons are made of the findings with those of a survey made for 1914 (E. S. R., 40, p. 473), of the indexes, 1915–1931, of taxes, farm labor wages, and the prices of milk, feed, eggs, and cows, and of the 1930 income and estimated incomes for 1931 and 1932.

Milk production per cow averaged 7,572 lbs. Feed bought constituted 41.2 per cent of all costs, consequently efficiency in the purchase and use of feed was an important factor in success. Milk sales averaged 84 per cent of all cash receipts. Labor income tended to increase with production per cow. On an average not more than one-fourth of the total receipts were left to pay interest on investments and for operators' wages, and with receipts of less than $7,000 the labor income of the operator was usually no larger than the wages of the hired man.

Classes and grades of cattle and calves marketed from North Dakota, 1929, H. G. Anderson and A. H. Benton (*North Dakota Sta. Bul. 254 (1932), pp. 46, figs. 23*).—The classes and grades of cattle and calves are described, and analysis is made of the data for about 15 per cent of the reported total shipments in the State and the prices received. Tables and charts are given showing for steers, heifers, cows, bulls, calves, and stags the percentages slaughtered and sold for feeders, by weights and grades, and the prices per 100 lbs. received for different grades.

Of the 58,814 cattle and calves in the sample, 34.1 per cent were steers, 16.1 heifers, 22.9 cows, 6.4 bulls, 20.4 calves, and 0.1 stags. Feeders constituted 72 per cent of the steers, 41 per cent of the heifers, 12.1 per cent of the cows, 36.7 per cent of the bulls, and 12.3 per cent of the calves. Of the steers slaughtered, 1.9 per cent graded choice, 14.5 good, 34.7 medium, 43 per cent common, and the remainder as cutter or low cutter. Of the cows slaughtered, approximately 50 per cent graded cutter and low cutter.

Swine, E. C. Voorhies and M. H. Blank (*California Sta. Bul. 523 (1932), pp. 135, figs. 29*).—This bulletin summarizes and interprets statistical data regarding the swine industry.

The status of the industry in the United States, California, and different foreign countries, the recent trends in swine raising, the slaughtering industry, consumption of pork and lard, prices and purchasing power of swine and pork products, feed costs, domestic and foreign trade, and the world situation in hogs and pork products are discussed.

Production and marketing of field beans in New York, H. N. Young (*New York Cornell Sta. Bul. 532 (1931), pp. 203, figs. 33*).—The production of beans in New York, the United States, and the world, trends in production, the United States exports and imports of dry beans, the tariff on beans, the canning industry, New York wholesale prices and trends in purchasing power of beans, 1875–1929, and relation of prices of different varieties of dry beans in western New York and the spread between farm and wholesale prices are discussed.

Based on data from 206 bean growers for the crop year 1927 and 195 growers for 1928 in four bean-growing areas of New York, a business study was made of the bean enterprise on western New York farms. Some of the findings are as follows:

With the exception of pea and medium beans, substitution of one variety of bean on the New York wholesale market for another variety does not take

place to any marked degree. Normally, on that market, Lima beans sell for the highest average price, followed in order by white kidney, red kidney, marrow, yellow-eye, pea, and medium beans. The purchasing power of New York wholesale prices for all varieties of beans has shown an upward trend since 1875, white kidney beans showing the highest percentage increase.

Farm prices of beans, 1896–1927, at Batavia showed more variation and greater differences between varieties than did New York City wholesale prices. Since 1896 the farm prices of pea, medium, and red kidney beans have declined relatively more than the New York wholesale prices, due largely to the increase in handling charges.

United States imports of dry beans have been increasing since 1892. Exports declined from 1892 to 1913, increased during the war, and since 1919 have again been declining rapidly. Exports of canned beans have increased rapidly.

The average cost of producing beans in the area studied was $3.15 per bushel in 1927 and $2.56 in 1928. Returns per hour of man labor were 67 cts. in 1927 and $1.63 in 1928. Labor was the most important item of expense, being about 25 per cent of the total expense. Yield was the most important factor affecting cost per bushel. In general, the most successful farms were those having the largest volume of business, good crop yields, and high-producing livestock, and a good balance between crop and livestock enterprises and making efficient use of labor and capital.

The author concludes that in order to secure an average labor income greater than a hired man's wages, it is necessary to have a farm production of beans of 200 bu. or more and receipts double the cost of labor, including operator's time, and equal to about 25 per cent of the capital used.

Some economic phases of the marketing of Maine apples, M. S. Parsons (*Maine Sta. Bul. 359* (*1931*), *pp. 105-164, pls. 8, figs. 8*).—The results of studies of market preferences for apples and of the economic significance of cull apples are reported.

The preference study is based on data regarding preferences and practices obtained from 70 managers of 44 grocery, 23 fruit, and 65 chain stores and from questionnaires answered for 283 families. Analysis is made of varietal, grade, count, origin, and container preferences shown by the store data, and of source of supply, knowledge of variety, buying practices, varietal and color preferences, and purpose for which purchased as shown by the consumer data.

The cull study is based on data obtained from commercial orchards in 1928 and 1929. Tables are included and discussed showing by varieties the principal causes of culls and the percentages of culls largely preventable by proper spraying or dusting or by pruning, thinning, fertilization, or careful handling and the percentage of culls for which the causes were uncontrollable. The economic significance as shown by grades, prices, and costs is discussed.

Of the causes of culls in the two years, 50.53 and 35.64 per cent, respectively, were due to causes largely controllable by spraying or dusting, 35.16 and 57.05 per cent to causes controllable by other orchard practices, and 14.31 and 7.31 to causes practically uncontrollable. Of the crops, 48.28 and 52.44 per cent, respectively, graded fancy or A, and 14.38 and 16.18 graded B.

Factors influencing corn prices, R. W. Cox (*Minnesota Sta. Tech. Bul. 81* (*1931*), *pp.* [*51*], *figs. 17*).—Charts are included and discussed showing for the period 1895–1929 the trends in the production of corn in the United States, in Iowa, Illinois, Missouri, Indiana, and Ohio, and in Kansas and Nebraska, and in the acreage, yield, and production in Minnesota; the relations of the price of corn in Chicago and the index of wholesale prices of all commodities, 1885–1929, and of December 1 farm prices of corn and wheat, oats, and barley in

the United States, 1870–1929, and in Minnesota, 1870–1929; and the average October–June prices and trend of prices of No. 3 yellow corn in Chicago, 1897–98 to 1915–16 and 1921–22 to 1928–29; and comparing the average monthly price of No. 3 yellow corn in Chicago and Minneapolis and of Minnesota farm prices, March 15, 1925, to March 15, 1929.

Analysis is made (1) of the relation of United States supply of corn to Minnesota and Iowa farm prices and the price of No. 3 yellow corn in Chicago and of Minnesota production to Minnesota farm prices; (2) the influences of the production of oats and barley, number of hogs and beef cattle on farms, distribution of production, and the quality of the corn crop on corn prices, and of these factors to the total United States supply on the average October–June price of No. 3 yellow corn in Chicago; (3) the value of the United States corn supply at Chicago prices of No. 3 yellow corn with varying total supplies; and (4) the seasonal movement of corn prices and the marketings of corn from Minnesota. An appendix shows the distribution of total receipts of corn in Chicago, 1924–1927, by classes and grades.

The total production of corn in the United States increased from 1895 to 1905 and then remained about stationary to 1929. The price and purchasing power of corn rose from 1897 to 1920 and again from 1921 to 1929 after the low level of corn prices in 1920 and 1921. The ratios of the price of corn and of oats and barley increased from 1870 to 1929. That of wheat changed but slightly. The supply of corn available for consumption in the United States was found to be the most important factor affecting prices. The following table shows the effects of different total supplies on prices:

Percentages of normal average October–June prices of corn with different United States supplies of corn, 1909–1915 and 1921–1928

	Size of supply (percentage of normal)			
	80	90	110	121
1909–1915	*Per cent*	*Per cent*	*Per cent*	*Per cent*
Minnesota farm	116.9	108.6	91.5	83.1
Iowa farm	132.6	116.3	83.7	67.4
Chicago, No. 3 yellow	126.7	113.4	86.6	73.3
1921–1928				
Minnesota farm	135.0	117.5	82.5	65.0
Iowa farm	142.7	121.4	78.6	57.2
Chicago, No. 3 yellow	133.6	116.8	83.2	66.4

The effects of other factors were as follows: Barley and oats, an increase of 21 per cent in the production about the same as a 1 per cent increase in the corn supply; hogs on farms, an increase of 10 per cent in number about the same as a 2.9 per cent decrease in corn supply; beef cattle on farms, a 28 per cent increase in number about the same as a 1 per cent decrease in corn supply; corn production in Iowa, Missouri, Kansas, Nebraska, Minnesota, and South Dakota, an increase of 10 per cent about the same as a 4.1 per cent decrease in total United States supply; and quality of corn crop, a 5 per cent increase about the same as a 1.5 per cent increase in total supply. A table is given showing the effect of changes in each factor, the other factors remaining at normal values. The maximum value of the corn supply was with a crop approximately 80 per cent of normal.

A guide to grain-trade statistics, H. S. IRWIN (*U. S. Dept. Agr., Misc. Pub. 141 (1932), pp. [2]+83*).—"This publication lists the various series of grain-trade statistics in common use, discusses some of their advantages and limita-

tions, shows how and by what agency each is compiled, and names some of the publications in which each may be found."

Crops and Markets, [May–June, 1932] (*U. S. Dept. Agr., Crops and Markets, 9 (1932), Nos. 5, pp. 153–184, figs. 3; 6, pp. 185–224, figs. 3*).—Included are tables, charts, notes, reports, and summaries of the usual types.

Farmers' cooperative associations in Florida.—I, Status and legal phases, M. A. Brooker and H. G. Hamilton (*Florida Sta. Bul. 245 (1932), pp. 47*).—This bulletin, prepared in cooperation with the division of resident teaching of the College of Agriculture, is the first of a series on farmers' cooperative associations in Florida. Included are a classified list of such associations, the text and a discussion of the Federal and State laws governing such corporations, and a table comparing important features of the Florida laws.

The efficiency of cooperative livestock shipping associations in West Virginia, W. W. Armentrout (*West Virginia Sta. Bul. 249 (1932), pp. 92, figs. 6*).—The conditions of production and marketing of livestock, the development, status, and volume of business of cooperative livestock shipping associations, and the county unit plan of organization of such associations in West Virginia are discussed. Analyses are made of the costs of marketing different kinds of livestock, of terminal and home market costs, of losses in transit, shrinkage, and the comparative transportation cost of different associations. Comparisons are made of independent dealers' and cooperative association prices of lambs and cattle and of the changes in dealer, cooperative association, and terminal market price, 1928 and 1929.

The efficiency of cooperative shipping associations as compared with their competitors is discussed on the basis of different items of marketing cost, marketing service rendered, and terminal prices received. The efficiency of associations on the basis of raising the plane of competition is also discussed.

Operating practices of Missouri cooperative elevators, W. J. Hart, W. R. Fankhanel, and F. L. Thomsen (*Missouri Sta. Bul. 311 (1932), pp. 8, fig. 1*).—This bulletin is based on the analysis of the business operations of 30 cooperative elevators in 1930 and discusses the financial operations, membership relations, and grain-handling practices.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Report of the director of the Extension Service, [1930] (*U. S. Dept. Agr., Rpt. Dir. Ext. Serv. [1930], pp. 68*).—This is the report to the Secretary of Agriculture for the fiscal year ended June 30, 1930, and covers the work of the Offices of Cooperative Extension Work (E. S. R., 65, p. 488), Exhibits, and Motion Pictures.

Report of extension work in agriculture and home economics in the United States, 1931 (*U. S. Dept. Agr., Ext. Work Agr. and Home Econ. Rpt. 1931, pp. 136, figs. 14*).—This publication supersedes the report noted above. Pages 87–136 are devoted to statistical tables.

FOODS—HUMAN NUTRITION

[Food and nutrition studies at the Florida Station], O. D. Abbot, L. W. Gaddum, and C. F. Ahmann (*Florida Sta. Rpt. 1931, pp. 81–86*).—Progress results are reported for studies dealing with yellow plant pigments as sources of vitamin A (E. S. R., 63, p. 692); the chemical composition of citrus fruits (E. S. R., 63, p. 691); the cooking qualities and chemical composition of two varieties of potatoes grown in Florida; the utilization of citrus fruits and black-

berries for vinegar making, and of certain varieties of grapes and blackberries for jelly making; the relation of growth to phosphorus, calcium, and lipin metabolism as influenced by the thymus; hair eating in rabbits; and hookworm infestation.

Composition of rabbit meat, H. R. McMillin (*Jour. Home Econ., 23 (1931), No. 12, pp. 1149–1151*).—In this contribution from the Bureau of Animal Industry, U. S. D. A., proximate analyses are given of the edible portion of four typical healthy domestic rabbits. Data are also included on the weights of the live rabbits and the dressed carcasses and parts. The composition of the rabbit meat was similar to that of poultry, with a relatively high content of moisture and protein and low content of fat.

Fermentation studies with soft wheat flours, C. P. Wilsie, C. S. Robinson, and O. B. Winter (*Michigan Sta. Tech. Bul. 121 (1932), pp. 39, figs. 9*).—This investigation was undertaken in an effort to find some satisfactory means of comparing the baking qualities of soft wheat flours which do not differ greatly in their protein content. A study was first made of some of the factors influencing the expansion test. This was followed by a study of the oxygen-carbon dioxide relationships in fermenting flour suspensions and doughs.

The flours used were from two varieties of soft winter wheat common to Michigan—Red Rock, considered one of the better soft wheat flours for breadmaking, and American Banner, a flour in particular demand by the pastry flour trade. The basic formula and procedure used in the study of the expansion of doughs made from the two flours were essentially those used in the laboratory of the National Milling Company at Toledo, Ohio, in so-called fermentation tests. Within the temperature range of 27 to 35° C. an increase in temperature caused more rapid expansion of the doughs. At 30° maximum differences in the volumes of the doughs were obtained, and consequently this temperature was selected as optimum. The maximum differences in expansion with reference to time were obtained with a first expansion period of from 1 to 1¼ hours. Greater total expansion and more rapid rate of expansion were obtained when the doughs were punched every half hour. A comparison of the two customary ways of making up the doughs led to the conclusion that the more satisfactory method is to determine the moisture content of the dough from each flour at its optimum consistency and add this amount of water to each sample.

With the manometric method of studying yeast metabolism, as used by O. Meyerhof,[1] it was found that the American Banner flour in suspension consumed more oxygen and produced more carbon dioxide than the Red Rock, either aerobically or anaerobically, and also combined with more carbon dioxide. It is concluded that there are characteristic differences in yeast metabolism with different flours which may be made use of to determine flour quality when suitable technic has been developed.

Definite recommendations are given for the expansion test based upon the findings in the present study.

A study of factors affecting the keeping qualities of soft wheat.—Flours (*Indiana Sta. Rpt. 1931, p. 25*).—This progress report notes the absence of relationship between total bacterial or mold content of a flour and its keeping quality.

The biological values of the proteins of breads baked from rye and wheat flours alone or combined with yeast or soya bean flour, S. K. Kon and Z. Markuze (*Biochem. Jour., 25 (1931), No. 5, pp. 1476–1484*).—Data are reported on the biological value, as determined by the method of Osborne,

[1] Biochem. Ztschr., 162 (1925), No. 1–2, pp. 43–86, figs. 5.

Mendel, and Ferry (E. S. R., 40, p. 765), of various breads commonly consumed in Poland, of several experimental breads, and of soybean flour and baker's yeast. Some of the breads were fed at only one protein level, but only the results obtained with those fed at several levels were included in the general discussion.

Two wheat breads, one containing approximately 8 and the other approximately 12 per cent of yeast on the dry basis, were tested at three levels of protein intake, yeast alone at three similar levels, and white bread with extra yeast at the two lower levels. In both cases and at all levels of protein intake the combinations of wheat flour and baker's yeast gave higher values than either of the components, thus indicating a supplementary relationship between the proteins of white flour and those of baker's yeast when mixed in the approximate proportions of 7:1 and 11:1.

Standardization of methods in experimental baking procedure (*Nebraska Sta. Rpt. [1931], pp. 30, 31*).—The results obtained in a study of changes in composition of bread doughs of varying initial sugar concentration produced by prolonged yeast fermentation are reported briefly.

Angel food cake from the thick and thin portions of egg white, L. W. HUNT and J. L. ST. JOHN (*Jour. Home Econ., 23 (1931), No. 12, pp. 1151–1156*).—In this contribution from the Washington Experiment Station, conclusions drawn in a previous study of the whipping and coagulation of eggs of varying quality (E. S. R., 65, p. 891) were confirmed in the relative volumes of angel-food cake baked from the thick and thin portions of egg white and unseparated whites. Cakes of larger volume resulted from thin than thick portions of the white and from whites brought to room temperature (about 21° C.) before beating than when beaten cold. A reasonable length of storage had little effect on the value of egg white for use in angel-food cake.

The loss of glucose from dried peas on soaking, W. M. CLIFFORD (*Biochem. Jour., 25 (1931), No. 6, pp. 1999–2003*).—Experiments similar to the earlier studies by Masters (E. S. R., 40, p. 360) on dried beans are reported for dried peas. On soaking in distilled water for from 18 to 24 hours the peas lost from 0.1 to 0.15 per cent glucose. The addition of alkalies to the water did not change the loss of glucose, but acids caused marked increases in loss which were greater with organic than inorganic acids. Dried peas soaked in water containing acids, alkalies, or salts did not take up as much water as when soaked in distilled water. The rate of cooking was unaltered by the soaking except in the case of alkalies and salts in such high concentration as to soften the whole pea in the cold and thus render it inedible.

These results indicate that "so far as carbohydrate loss is concerned, it is immaterial whether peas are soaked in hard or soft water. Further, the addition of the customary 'pinch' of bicarbonate does not alter this slight loss or accelerate the cooking of the soaked peas. Its only effect is the usual attainment of a bright green color by the peas soaked in a weak solution of alkali."

Nutritive properties of the seed of the tobacco plant (Nicotiana tabacum), L. B. MENDEL and H. B. VICKERY (*Soc. Expt. Biol. and Med. Proc., 29 (1931), No. 3, pp. 290, 291*).—In this preliminary report it is noted that in physiological tests to determine the presence of nicotine in tobacco seed, rats on a ration consisting either of ground tobacco seed 98 and Osborne and Mendel salt mixture 2 per cent or ground tobacco seed 99, sodium chloride 0.5, and calcium carbonate 0.5 per cent, with cod-liver oil at the rate of 10 drops daily, grew at a satisfactory rate and appeared normal in every respect. This led to a detailed study of the nutritive properties of the tobacco seed, the preliminary results of which are noted briefly. The seeds are said to yield 43 per cent of a pale yel-

low oil when extracted with anhydrous ether and to have a crude protein content of approximately 20 per cent. At least half of the protein is a crystalline globulin resembling edestin from hemp seed. Tests for the various vitamins showed that the seed contains traces of vitamin A, enough vitamin B and G for growth and general well-being but not for lactation, no vitamin D, and an abundance of vitamin E. The total protein is of good biological quality.

Fruit products (*California Sta. Rpt. 1931, pp. 108–110*).—Data are reported briefly on the preservation of fruit products, including the vitamin content of dried fruits, the oxidase activity of apples and bromelin activity of pineapples as affected by H-ion concentration, composition of grapes and grape products, the pickling of olives with respect to oil content, bacterial infection, and nature of the bitter principle, the frozen storage of fruits and vegetables, and the lethal effect of various forms of electrical energy on yeasts and vinegar bacteria.

Quick-freezing citrus fruit juices and other fruit products.—A preliminary report, E. M. Chace and H. D. Poore (*Indus. and Engin. Chem., 23 (1931), No. 10, pp. 1109–1112, figs. 5*).—This is a progress report of studies at the Los Angeles Laboratory of Fruit and Vegetable Chemistry of the U. S. Department of Agriculture on the quick freezing of citrus fruits and various fruit juices in different types of containers.

A study of Chinese American children.—I, Dietary study, J. E. Hawks (*Jour. Amer. Dietet. Assoc., 7 (1931), No. 3, pp. 203–223, figs. 3*).—The dietary study reported was conducted by the individual method on 22 Chinese children in 11 families living in Chicago. Three of the children were born in China and the others were of the first generation born in America. With the exception of 1 girl of 17, the data for whom are omitted in the averages, all of the children (12 boys and 10 girls) were between the ages of 5 and 14 years. Among the data reported are the following:

The average daily consumption of various types of food was rice 276 g, other cereals 93.5, vegetables 133, fruit 121, milk 268, butter 8, meat 152, and eggs 35 g. The daily total caloric value of the food consumed ranged from 967 to 2,342 calories. With few exceptions the values were less than usually reported for American children of the same age, but approximated the standards on the weight basis. Seven of the children had caloric intakes less than 50 per cent above their basal requirement. About 40 per cent of the calories were derived from cereal sources.

The total protein ranged from 35.3 to 90.1 g and the values per kilogram body weight from 1.89 to 3.8 g, with an average of 58 per cent in the form of animal protein. The calcium intake varied from 0.011 to 0.059 and that of phosphorus from 0.024 to 0.064 g per kilogram of body weight. The ratio of calcium to phosphorus averaged 1:1.4.

Milk in the diets of young children, H. McKay (*Ohio Sta. Bimo. Bul. 157 (1932), pp. 135–137*).—This general discussion includes data on the milk consumption of the group of preschool children in the study noted previously (E. S. R., 66, p. 90). During January the milk consumption ranged from 1.4 to 3, with an average of 2.3 cups per child per day, including the milk used in food preparation as well as a beverage. The milk contributed 31 per cent of the total calories, almost 50 per cent of the protein, 80 of the calcium, 59 of the phosphorus, and approximately 20 per cent of the iron. In March the same children were found to be using more milk than in January, the quantities ranging from 1.8 to 3.5, with an average of 2.7 cups per child per day. During this time the milk furnished 37 per cent of the total calories, 52 of the protein, 84 of the calcium, 62 of the phosphorus, and 21 per cent of the iron. "The increased use of milk in March over that used by the group in

January is encouraging and illustrates the fact that children's food habits may be improved with little difficulty and that a custom may be established by repetition."

Human milk studies, VII–X (*Amer. Jour. Diseases Children, 42 (1931), No. 3, pp. 569–589; 43 (1932), Nos. 1, pp. 40–51, figs. 2; 4, pp. 828–844, figs. 6; 5, I, pp. 1062–1076, figs. 6*).—A continuation of the series of papers noted previously (E. S. R., 65, p. 398).

VII. *Chemical analysis of milk representative of the entire first and last halves of the nursing period*, I. G. Macy, B. Nims, M. Brown, and H. A. Hunscher.—This paper deals with the composition of the milk produced by three superior milk producers of the Mother's Milk Bureau of Detroit during the first and last halves of the nursing period, represented by a complete emptying of the breasts by manual expression.

The data show that as nursing progresses the milk becomes richer in most constituents. The medians of the percentage differences in all of the comparisons between the first and last halves were fat +26, lactose +0.2, protein +2.4, total solids +8, and solids-not-fat −4.7 per cent. Of the nitrogenous constituents increases were shown in total, casein, and nonprotein nitrogen and decreases in protein nitrogen other than casein and in amino acid nitrogen. Of the mineral constituents calcium showed an increase of 0.4 mg per 100 c c and phosphorus 7.7 mg per 100 c c. These differences increased to a marked extent the fat-protein ratio and to a lesser degree the fat-phosphorus ratio, while the ratio of chlorine to lactose remained markedly constant.

These findings are discussed in considerable detail, with many references to the literature. Among the practical points brought out in the general discussion are the possibility that underweight weak babies may be getting milk of decidedly inferior quality, and that on the other hand the eczema which sometimes develops in strong healthy breast-fed babies may be due to the richness of the final portions of the milk. The suggestion is made that in the former case the first portion of the milk should be removed by manual expression before the baby is allowed to nurse and in the latter the baby should be allowed to nurse only a few minutes from each breast, thus getting the first portion of the milk and not the richer strippings.

VIII. *A comparison of the composition of the milk from the two breasts*, M. Brown, I. G. Macy, B. Nims, and H. A. Hunscher.—The samples of milk here used were taken from both breasts by manual expression within a 15-minute period at regular 4-hour intervals throughout the day and night. Analyses of the samples showed that in the three women serving as subjects the milk secreted by the two breasts was uniform in the percentage concentration of fat, protein, lactose, total solids, solids-not-fat, total ash, calcium, and phosphorus. The volumes of milk obtained from the two breasts showed differences as high as 346 c c daily, thus showing that the total production of the various nutrients was unlike in the two breasts. In one subject the milk secreted by the left breast during one day contained 13.1 g of fat, 3.2 g of protein, 30.8 g of carbohydrate, and 254 calories more than that secreted by the right breast.

IX. *Variations in the composition of milk at four hour intervals during the day and night*, B. Nims, I. G. Macy, M. Brown, and H. A. Hunscher.—The analyses reported were made on a total of 114 samples of breast milk collected at successive 4-hour intervals throughout an entire day and night intermittently in the lactation cycle and in two instances over a consecutive 72-hour period.

There were significant changes during the 24-hour periods in all three subjects in the volume of the milk and characteristic daily trends in variation in

composition of the milk. The fat content rose sharply from 6 to 10 a. m., dropped from 10 a. m. to 2 p. m., and showed small irregular fluctuations from 6 p. m. to 6 a. m. The same general trend was shown in total solids. The total volumes and concentrations of water and lactose were higher at night than during the day. Protein showed maximum values at 2 and 6 p. m. Total ash, calcium, and phosphorus showed minimum values at 6 and 10 a. m. and maximum at 2 p. m. The reverse was true of chlorides. These trends were maintained consistently regardless of the differences in environment and variations in food, rest, and stage of lactation. A comparison of the variability of the different constituents of the milk in two of the subjects, who, although sisters, were quite different in emotional nature, showed a greater variability in the fat content of the milk of the one who was nervous and high strung than in that of the other who was more phlegmatic. No differences could be noted, however, in the variability of the other constituents.

X. *Daily and monthly variations in milk components as observed in two successive lactation periods*, B. Nims, I. G. Macy, H. A. Hunscher, and M. Brown.—The extensive data obtained in this phase of the investigation included monthly analyses of the milk during two lactation periods of two of the three subjects and one of the third and also analyses of the milk obtained during the earlier months of lactation of another group of women from the same milk bureau. The general summary and conclusions of the authors are as follows:

"The nitrogen content of the milk decreased rapidly up to the sixth month and then remained fairly constant; the concentration of total ash and calcium decreased gradually; the phosphorus diminished gradually until the later months, when an increase occurred; the fat and total solids also decreased during the earlier months of lactation and then regained high values in late lactation.

"The data demonstrate that the various milk components, although varying from day to day and changing during lactation, fluctuate about a level that is characteristic for the individual woman, and that this individuality of fluctuation is maintained not only during one lactation but also through successive lactation periods. Over and above these individual trends in fluctuation, the composition of the milk in all three subjects showed a similar trend of changes as lactation progressed."

Many references to the literature are included in each paper.

Human milk studies.—XI, Vitamin G (B_2) content of mixed milk, E. Donelson and I. G. Macy (*Amer. Jour. Physiol., 100 (1932), No. 2, pp. 420–425, fig. 1*).—This continuation of the series of papers noted above reports the results obtained in studies by the Bourquin-Sherman method (E. S. R., 66, p. 410) of the vitamin G content of fresh pooled breast milk from the Mother's Milk Bureau of Detroit. Quantities of from 3 to 5 c c daily as the only source of vitamin G were required to support the unit gain in weight of 3 g weekly in the standardized test rats throughout the experimental period of 8 weeks. The greater number of animals receiving this amount of milk showed deficiency symptoms. Quantities of 10, 15, and 20 c c daily produced increasing gains in body weight, and even the highest amount did not promote growth at the rate of the positive controls receiving alkalized autoclaved yeast. "If the above facts on breast milk produced by mothers on dietaries which are known to be adequate can be applied to infant feeding on the basis of comparative body weights, the quality of breast milk in some cases where the maternal diet is limited, either through choice or deprivation, may fall short of satisfying the vitamin G needs of the rapidly growing infant."

A quantitative study of the dietary of the human mother with respect to the nutrients secreted into breast milk, C. F. Shukers, I. G. Macy,

B. NIMS, E. DONELSON, and H. A. HUNSCHER (*Jour. Nutrition, 5 (1932), No. 2, pp. 127–139, fig. 1*).—This phase of the extensive investigation of human milk production deals with the relation between the intake of calories, protein, fat, carbohydrate, calcium, and phosphorus during prolonged lactation, as noted previously (E. S. R., 66, p. 891), and the outgo of these substances in the milk produced.

In calculating the total energy requirement of these women, the allowances for the actual process of milk secretion suggested by Rose (E. S. R., 62, p. 686), of 10 per cent of the calorie output in the milk, and by Rand, Sweeny, and Vincent,[1] of 2 food calories for each calorie secreted in the milk, were both used. These calculations showed that in these superior milk producers there would have been left for maintenance on the former allowance 2,000, 3,000, and 2,600 calories and on the latter more liberal allowance for the needs of milk production, 100, 1,600, and 1,600 calories for the three subjects, respectively. The fact that only small losses in weight were shown by the first two subjects and a slight gain by the third indicates that the second of the two allowances would have been far too liberal.

Similar calculations of the quantities of the various food essentials available for utilization in metabolism showed them to be fully adequate even in the case of calcium and phosphorus, although, as has been noted, the calcium balances were negative throughout most of the lactation period and the phosphorus balances occasionally negative. Commenting upon the inability of these women to utilize the apparently available calcium, the authors state that "it is evident that providing an adequate diet is not the only essential. More satisfactory ways and means of inducing better digestion, absorption, and assimilation of the food materials into the body must be devised if lactation is to leave the maternal body unimpaired."

Psychophysiological studies.—I, The technique of securing quantitative and coördinated psychological and physiological data on lactating women in their usual home environment, H. A. HUNSCHER, E. L. VINCENT, and I. G. MACY (*Child Devlpmt., 1 (1930), No. 1, pp. 15–28, fig. 1*).—The technic which was developed to measure quantitatively the psychological reactions of the subjects of the extensive investigation of human milk production noted above is described in detail. The method of coordinating psychological and physiological reactions is illustrated by a comparison of the volume output of milk by one of the subjects with her emotional reactions.

A study of the calcium retention on a diet containing American Cheddar cheese, M. G. MALLON, L. M. JOHNSON, and C. R. DARBY (*Jour. Nutrition, 5 (1932), No. 2, pp. 121–126*).—Calcium balance experiments are reported for two young women subjects on a simple diet in which in one series American Cheddar cheese furnished 86 and 85.7 per cent, and in the other pasteurized milk furnished 87.7 and 87.4 per cent, respectively, of the total calcium of the diet. Each series consisted of a 3-day preliminary period followed by a 6-day experimental period, the milk series following directly after the Cheddar cheese.

In the first subject the calcium balances on the cheese and pasteurized milk were +0.1 and −0.2 and in the second −0.8 and −0.6 mg per kilogram per day, respectively. The authors conclude that the calcium of American Cheddar cheese is utilized as well as that from pasteurized whole milk.

The calcium in cheese (*Jour. Amer. Med. Assoc., 98 (1932), No. 19, pp. 1657, 1658*).—In editorial comment on the study noted above, attention is called to

[1] Growth and Development of the Young Child, W. Rand, M. E. Sweeny, and E. L. Vincent. Philadelphia and London: W. B. Saunders Co., 1930, pp. 394, pls. 2, figs. 32.

some of the earlier prejudices against cheese, particularly its alleged indigestibility. The finding that the calcium of American cheese is as well utilized as that in milk is considered to be another step "in breaking down the unwarranted prejudices against an undervalued food."

Growth and development with special reference to domestic animals, XX–XXII (*Missouri Sta. Research Bul. 166 (1932), pp. 71–76, figs. 3; 77–82, figs. 8; 83–87, figs. 4*).—These studies form a part of the extensive investigation noted on page 586.

XX. *Relation between basal metabolism and body weight in the growing rat*, U. S. Ashworth, S. Brody, and A. G. Hogan.—Basal metabolism data on rats reported by Mitchell and Carman (E. S. R., 55, p. 794) and Benedict and MacLeod (E. S. R, 62, p. 192) and new data obtained by the method of Benedict and MacLeod, with certain modifications, on various groups of rats from birth to over one year of age were studied to determine whether or not the energy metabolism of the white rat follows the same course with increasing weight, as has been found to hold for domestic animals. This was found to be the case. The declining metabolism with increasing weight was satisfactorily represented by the equation $Q/m=Ae^{-km}$, where k is of the order of 0.003. This indicates that the metabolism per unit weight in the rat declines at the rate of 0.3 per cent per increase of 1 g of body weight. The basal metabolism of fully grown rats was between 90 and 100 and that of nursing rats 200 calories per kilogram body weight.

Several diets were used of varying composition, particularly with reference to protein content. Graphic and numerical comparisons of the data obtained for the various groups showed that the winter group of Benedict and MacLeod had the highest and the summer group the lowest metabolism. The normal curves in the present study fell between the winter group of Benedict and MacLeod and the average of the data reported by Mitchell and Carman. The rats on the high protein diet were heavier and fatter and had a lower metabolism than those on the low protein diet.

Data are included on the basal metabolism of a group of stunted rats which gained only 60 g from the time of weaning to one year of age.

XXI. *Relation between basal metabolism and body weight in man; published data*, S. Brody and R. C. Procter.—The exponential equations developed in the course of the investigation have been applied to the extensive basal metabolism data on human subjects, particularly those of Benedict (E. S. R., 60, p. 389) and Benedict and Talbot (E. S. R., 45, p. 561). The data were found to fit the exponential equations $Q/m=49e^{-0.[illegible]m}+20$ for males and $Q/m=50e^{-0.[illegible]m}+13$ for females, where Q is the heat production per day per kilogram meter. About 78 per cent of the data examined were within ± 10 per cent and 99 per cent within ± 20 per cent of the computed average.

The apparently low efficiency of growth in humans, as pointed out by Rubner, is considered to be due not to differences in the intensity of the basal metabolism or in the efficiency of food utilization but to the relatively low rate of growth and consequently greater energy expenditure for maintenance in this species.

Attention is called to the relative influences of body weight on the relative metabolism of human males and females and incidentally of white and Australian males. The metabolism curves of American boys and girls are shown to be nearest together between 20 and 30 kg body weight (7 to 13 years), after which there is an increasing divergence. Similarly, the metabolism curves of Australian and American men are nearer together in the region of 40 kg (14 to 15 years), after which they diverge. The divergences in both cases

begin at puberty and are explained thus: "The female reaches maturity and her mature weight earlier than the male, so that for a given weight the American white female is in a more advanced physiological age than the American white male, and the Australian male is probably also, for a given weight (*following puberty*), *in a more advanced physiological age; hence, the lower* metabolism of American females and Australian males than of American males."

XXII. *Relation between basal metabolism and body weight in laboratory animals; published data*, S. Brody and R. C. Procter.—From published metabolism data on the dog, the guinea pig, and the rabbit, and hitherto unpublished data of Riddle, Smith, and Benedict on pigeons and doves, the following conclusions are drawn:

"The exponential relation between basal metabolism and body weight represents not only the metabolism of young animals, but it also represents the metabolism of approximately mature animals of the same species, as in the dog. The decline of metabolism with increasing weight is characteristic of each species depending on the rate with which maturity is approached. The more rapidly an animal matures, the more rapidly does its metabolism per unit weight decrease with increasing weight. Thus, the dove approaches maturity at the most rapid rate, and its decline of metabolism with increasing weight is also most rapid."

The relation of acid-base balance of the ration to the growth and reproductive functions of the rat, H. S. Mitchell and L. Miller (*Jour. Home Econ., 23 (1931), No. 11, pp. 1043–1050*).—Rat feeding experiments are reported in which different degrees of acidity and alkalinity of an adequate ration were created by the addition of various acids and salts and by the substitution of whole wheat bread crumbs for dried celery tops in the ration. The range of acidity and alkalinity was equivalent to 19.4, 9.4, and 5.2 c c N acid and 0.66, 10.6, and 20.6 c c N alkali per 100 g of dry ration. These acid-base variations per se did not markedly interfere with growth, reproduction, or calcification of the bones. Disturbances in growth and calcification, noted by Samuel and Kugelmass in animals on a moderately acid-forming diet, are attributed to abnormal calcium-phosphorus ratios in the diet. "Such disturbances in Ca : P ratio may account for certain detrimental effects of the average American diet, which is potentially acid but is also low in calcium."

The authors conclude that the albino rat is not a suitable experimental animal for studying the potential acid-base balance of foodstuffs.

The amino acid deficiencies of beef, wheat, corn, oats, and soy beans for growth in the white rat, H. H. Mitchell and D. B. Smuts (*Jour. Biol. Chem., 95 (1932), No. 1, pp. 263–281, figs. 2*).—In this investigation at the Illinois Experiment Station the amino acid deficiencies of protein mixtures occurring in a number of natural foods were determined by the paired feeding method. Eight pairs of rats were used in each test.

The proteins of lean beef and soybeans were biologically deficient in cystine, while the proteins of wheat, corn, and oats were deficient in lysine. Correcting the deficiencies of beef, soybeans, and wheat resulted in a considerable improvement in the growth-promoting value of the proteins. On the other hand, correcting the lysine deficiencies of oats and corn resulted in a distinct but inconsiderable increase in growth-promoting effect. In the case of corn, a second deficiency, tryptophane, developed after the addition of a minimum amount of lysine. Adding tryptophane to a ration containing 8 per cent of corn protein showed no appreciable effect on growth-promoting value, but when such a ration had been previously supplemented with a small amount of lysine

there was a distinct increase in growth-promoting value. When tryptophane was added to an unsupplemented corn ration, there was a slight but significant depressing effect on weight gains, but no effect on body growth.

The relation between dietary cystine and the growth and cystine content of hair in the rat, D. B. SMUTS, H. H. MITCHELL, and T. S. HAMILTON (*Jour. Biol. Chem., 95 (1932), No. 1, pp. 283–295, figs. 4*).—Some of the paired tests in the previous study were used in determining the dietary factors affecting growth and cystine content of hair.

It was found that rations deficient in cystine inhibited body growth and also hair growth as measured in dry weight per unit of surface. The hair grown on this ration also contained a smaller amount of cystine. A certain proportion of the deficient hair coat contained fibers whose medullary cells were broader in shape and loosely packed together. In such hairs the amount of cortex was much less than in normal hair, and the proportion of air cells and medullary cells was correspondingly higher. Adding cystine to a deficient diet corrected the effects on body and hair growth and on hair composition, but adding cystine to a nondeficient diet had no clear-cut effect on hair composition.

Rations deficient in lysine inhibited body and hair growth, but did not lower the cystine content of the hair produced.

Blood regeneration studies, I, II (*Amer. Jour. Physiol., 98 (1931), No. 4, pp. 636–643, figs. 2; 99 (1932), No. 2, pp. 391–397*).—This contribution from the Minnesota Experiment Station is presented in two papers as follows:

I. *Changes in the volume, number, and size of the erythrocytes in hemorrhagic anemia*, J. M. Leichsenring and H. H. Hönig.—The experimental animals used in this study were 7 normal adult dogs, 2 females and 5 males. One of the dogs was on a diet of table scraps and the other on a synthetic diet similar to that of Karr (E. S. R., 44, p. 860). The yeast in the diet of 3 of the dogs had been autoclaved to destroy the antineuritic vitamin. After initial blood samples had been taken for analysis, anemia was induced in all of the animals by two large hemorrhages 2 or 3 days apart, one-fourth of the determined total blood volume being removed each time. Following the second bleeding, blood samples amounting to approximately 50 c c were removed on alternate days during the first week and once weekly thereafter for 12 weeks. The dogs remained in good health throughout, with the exception of loss of appetite after a few weeks in those receiving the diet low in vitamin B. This was restored by the administration of dried whole yeast for 3 consecutive days. The data from all of the animals were grouped together.

The total cell volume in percentage was unaltered throughout the entire period. The red cell counts returned to normal by the eighth week of the post-bleeding period. The diameters and volumes of the red blood cells diminished during the regeneration period, and there was a steady decrease in the proportion of normal size cells and an increase in the proportion of cells of much smaller size. A rapid increase in the number of red cells was associated with a marked decrease in cell diameter and individual cell volume.

II. *Observations on the blood of normal dogs with special reference to the measurement of volume, erythrocytes, leucocytes, and nitrogenous constituents*, J. M. Leichsenring, A. Biester, H. H. Hönig, S. M. Furnas, E. S. Foss, and M. V. Routt.—Physical and chemical measurements on the blood of 32 adult dogs, 16 males and 16 females, are reported, with the following results:

"The weighted average for total blood volume is 7.18 c c and for cell volume 3.43 c c per 100 g body weight; plasma per cent, 52.3; red cell count, 7.17 millions per cubic millimeter; red cell diameter, 7.0μ; white cell count, 8.76 thousands per

cubic millimeter of blood. The weighted average per 100 c c of blood for total protein is 19.64 g; for hemoglobin, 14.11 g; for nonhemoglobin protein, 6.64 g; for nonprotein nitrogen, 35.4 mg; urea nitrogen, 11.04 mg; creatinine, 1.52 mg; amino acid nitrogen, 10.77 mg.

"*No significant sex differences were observed in any of the physical or chemical measurements reported.*"

The assimilation of aluminium by the human system, S. J. LEWIS (*Biochem. Jour., 25 (1931), No. 6, pp. 2162–2167*).—In a large Hilger quartz spectrograph, the two principal aluminum lines could be readily detected when aluminum was added to the blood in the proportion of 1 part per 1,000,000 and recognized in as low a concentration as 1 in 10,000,000. With the use of the spectrograph it was demonstrated that normal blood usually contains no aluminum, and that a considerable quantity of aluminum is present in the blood of the same person after consumption of even one meal of aluminum-containing food. Aluminum was also found in the milk of cows, goats, and two human subjects after the consumption of aluminum with the food.

A specific hematopoietic hormone in normal gastric juice: Preliminary note, R. S. MORRIS, L. SCHIFF, G. BURGER, and J. E. SHERMAN (*Jour. Amer. Med. Assoc., 98 (1932), No. 13, pp. 1080, 1081*).—In this preliminary report the authors announce the concentration from normal gastric juice by vacuum distillation of a product which on intramuscular injection in patients with pernicious anemia is followed by a remarkable and almost immediate reticulocyte response. The substance is considered to be the specific hormone, the absence of which, according to the theory of Castle and associates (E. S. R., 66, p. 797), is the cause of pernicious anemia. "For the hematopoietic hormone which we have demonstrated in normal human gastric juice we have proposed the name addisin, after Thomas Addison, who first described pernicious anemia."

Vegetables as vitamin sources [trans. title], A. SCHEUNERT (*Deut. Med. Wchnschr., 57 (1931), No. 20, pp. 835–839*).—The data reported on the content of vitamins A, B, and C in fresh and cooked vegetables have for the most part been noted from another source (E. S. R., 62, p. 896). Concerning vitamin D, it is stated that an examination of 83 varieties of fruits and vegetables by means of prophylactic experiments on young rats has led to the conclusion that vitamin D is practically absent from fresh green vegetables, although traces of this vitamin were found in cauliflower, beans, and rhubarb. It is noted particularly that cucumbers grown under glass transmitting ultra-violet light showed no vitamin D. Attention is called to the observations noted below that several varieties of mushrooms grown out of doors contain appreciable amounts of vitamin D.

The vitamin content of edible mushrooms [trans. title], A. SCHEUNERT and J. RESCHKE (*Deut. Med. Wchnschr., 57 (1931), No. 9, pp. 349–351, figs. 3*).—Data are reported on the content of vitamins A, B_1, C, and D in edible mushrooms, raw, cooked in various ways, and canned.

Of the four species examined for vitamin A, the chanterelle [*Cantharellus cibarius*], "Maronenröhrling," [probably chestnut tongue, *Fistulina hepatica*], edible Boletus [*B. edulis*], and field agaric [*Agaricus arvensis*], only the chanterelle contained appreciable amounts of this vitamin. This species appeared to be very rich in vitamin A, which was not destroyed to any extent after the material had been cooked for 1½ hours in its own juice, packed in glass cans, and heated again at 100° C. Amounts of the sterilized material as small as 1 g or even 0.5 g daily produced good growth as the sole source of vitamin A.

Vitamin B_1 occurred in the same species of mushrooms in traces only, and the presence of vitamin C could not be detected. The common cultivated mushroom

grown indoors in the dark [probably *A. campestris*] contained no appreciable amount of vitamin D, while various species of wild mushrooms, such as chanterelle, edible Boletus, and the common morel or sponge mushroom, contained sufficient vitamin D to cure rickets on the Steenbock-Black diet in 2-g daily amounts.

Vitamin content of three varieties of spinach, H. B. KIFER and H. E. MUNSELL (*Jour. Agr. Research [U. S.], 44 (1932), No. 10, pp. 767–771, figs. 2*).—This study was undertaken by the U. S. D. A. Bureau of Home Economics, with the cooperation of the Maryland Experiment Station, to determine whether or not any relationship exists in spinach between leaf type or color and vitamin content. Three varieties of spinach grown on the same plat and during the same season were tested—Virginia Savoy, with dark green, broad, deeply wrinkled leaves; Princess Juliana, with bluish green, deeply wrinkled leaves; and Viroflay, with yellow green, spear-shaped leaves, smooth or slightly crumpled at the base. In feeding the material, care was taken that equal quantities of the material taken from the same part of the plant were fed to litter mates.

In the vitamin A experiments, 0.012 g daily of the spinach gave growth nearest the standard 3 g a week of the Sherman and Munsell technic. On this quantity the total average gains in weight during the 8-week period were 22, 24, and 22 g, respectively, thus indicating that the three varieties were of about equal potency as sources of vitamin A. This was confirmed with other quantities. On 0.006 g portions the total average gain in weight for the 8 weeks was in each case 8 g.

The vitamin B tests were made by the method of Sherman and Spohn before the differentiation of vitamin B. On 8 g daily the total average gains in weight in 7 weeks were 40.5, 39.8, and 37.5 g, respectively, showing that the three varieties were of nearly equal potency as sources of the vitamin B complex. This was also confirmed by the results obtained with other quantities. One g daily just sufficed for maintenance.

In the vitamin C experiments no definite conclusion could be drawn as the supply of spinach was so limited that only a small number of animals were used, and the experiments were continued for only 77 days. The results obtained indicate, however, that the Princess Juliana probably contains slightly less vitamin C than the other two varieties.

Observations and measurements of vitamin A [trans. title], P. KARRER, B. and H. VON EULER, H. HELLSTRÖM, and M. RYDBOM (*Arkiv Kemi, Min. och Geol., 10 B (1931), No. 3, Art. 12, pp. 6*).—Miscellaneous studies on the relationship of carotene to vitamin A in different materials are summarized briefly, with the following conclusions:

The carotene of the blood is concentrated entirely in the serum, and is much higher in herbivorous (ox blood) than in carnivorous (human and rat blood) animals. In ox blood serum the carotene content was much higher after summer than winter feeding. No evidence was found of any growth factor of carotenoid nature other than carotene in the serum.

Antimony trichloride and spectrophotometric examination of two vitamin preparations from fish-liver oil, one the biosterin of Takahashi and the other a vacuum distillate from cod-liver oil, indicated that the former contained 2 parts of carotene to 1 of vitamin A and the latter 1 part of carotene to 4 or 5 of vitamin A.

Petroleum ether extracts of barley embryo and of *Fucus vesiculosus* gave similar absorption spectra, the former with maxima at 482, 458, and 498 mμ and the latter at 483, 456, and 439 mμ. The barley germ extract gave no blue coloration with antimony trichloride.

Characterization of vitamin-A.—Part II, Biological experiments, B. AHMAD and J. C. DRUMMOND (*Jour. Soc. Chem. Indus., Trans., 50 (1931), No. 22, pp. 184T–186T, fig. 1*).—This is essentially a condensed report of the investigation noted previously from a more complete report (E. S. R., 67, p. 342). In addition, data are reported on the response of vitamin A depleted rats to preparations of dihydrocarotene made by reducing carotene with aluminum amalgam.

One or two cases of irregular growth occurred, but, in general, the results were negative. Carotene reduced with hydrogen in the presence of palladium at room temperature produced no blue color with antimony trichloride, and was of no value to rats deprived of vitamin A when administered in doses as high as 0.01 mg. The observations reported are thought to suggest that a large proportion of the carotene absorbed into the organism may be rapidly transformed into other substances, but that the formation of vitamin A is relatively slow and possibly concerns quite a small proportion of the pigment. It is considered probable that the breakdown of carotene in the organism may follow several paths, and that reduction may be one of the changes involved.

A note on the effect of ultra-violet light on the vitamin A of butter, C. L. SHREWSBURY and H. R. KRAYBILL (*Science, 75 (1932), No. 1932, p. 86, fig. 1; abs. in Indiana Sta. Rpt. 1931, p. 55*).—This brief note from the Indiana Experiment Station summarizes the results of a study of the effect of ultraviolet light under varying conditions on the color and vitamin A content of butterfat. The butterfat was exposed in large flat dishes to the rays of a quartz mercury arc at a distance of 15 cm for 6 hours. In one case the material was not protected from the air, and in the other it was exposed in an atmosphere of nitrogen freed from oxygen.

Practically complete loss of color and destruction of vitamin A took place in the sample exposed to air. The sample exposed in nitrogen did not fade, and showed no appreciable loss in antiophthalmic properties, but some reduction in growth-promoting properties as compared with an untreated sample of the same butter. When some of the sample exposed in the air was mixed with untreated butter and fed to rats, a definite slowing of growth occurred as compared with the growth of controls fed the untreated butter in equivalent amounts.

It is thought that the destruction of vitamin A taking place during the fading of butterfat is due not to a direct effect of ultra-violet light but to oxidation produced indirectly by the ultra-violet radiations. It is suggested that irradiation in air and to some extent in an atmosphere of nitrogen "produces a principle that retards growth of rats. This principle was not of sufficient strength to cause death before the onset of vitamin A deficiency symptoms."

Plant pigments in the nutrition of the chicken, W. C. RUSSELL and A. L. WEBER (*Soc. Expt. Biol. and Med. Proc., 29 (1931), No. 3, pp. 297, 298*).—Data are reported briefly confirming earlier findings of Karrer et al. that carotene has provitamin A properties for chickens but that xanthophyll has not, and showing in addition that chlorophyll also lacks provitamin A properties. Uric acid determinations of the blood showed lower figures for the carotene group, 3.7 mg per 100 c c, than for xanthophyll, 7.2, and chlorophyll, 5.8 mg per 100 c c. Chickens on a white corn ration had average uric acid values of 9.8 mg and on the same ration with yellow corn in place of white 3.3 mg per 100 c c, a value considered normal. Since in earlier studies a high uric acid value was noted in birds deprived of food, it is not known whether the high values noted in the present study are due indirectly to inanition or directly to vitamin A deficiency.

The distribution of the vitamin B complex.—III, Fruits, M. H. Roscoe (*Biochem. Jour.*, 25 (1931), No. 6, pp. 2050–2055).—Following the methods in previous studies of the series (E. S. R., 67, p. 343), the author has determined the content of vitamins B (B_1) and G (B_2) in oranges, tomatoes, bananas, and apples prepared "by peeling, coring or removing the pips, and then mincing. The water content of the pulps so obtained was reduced by exposing to the air in thin layers at 37° [C.]. The fruits were bought from time to time throughout the experiments. No particular variety was adhered to. The reduced pulps were incorporated in the diets in varying percentages (reckoning from the dry weights), but the rats were only allowed to consume enough of these diets to provide a given amount of the fruit each day, the remainder of their requirements being satisfied with a vitamin-free diet."

The values reported are given in dry weights and also in relative potency as compared with yeast as 100 in the dry and fresh state. The author's summary in terms of dry weight shows that in content of vitamin B_1 oranges rank the highest of the fruits tested, followed in decreasing order by tomatoes, bananas, and apples. When expressed in terms of wet weight, however, the order is reversed for bananas and apples. The values obtained for vitamin B_2 led to the conclusion that, on the basis of dry weight, the orange, tomato, and banana are equivalent sources of this vitamin, with apple of lower value. On the basis of fresh weight, however, the banana is from two to three times as rich as the other three fruits, the relative decreasing order of potency of which is orange, apple, and tomato. In the table giving the potency on the fresh basis of the various foods tested in the entire series of studies, the orange and banana are placed in the same group with respect to vitamin B_1 potency (5 to 10 as compared to yeast 100) as meat, water cress, lettuce, spinach, white cabbage, and carrot; and the tomato and apple in the same group as potato, green cabbage, and turnip (2.5 to 5). In vitamin B_2 potency the banana is placed in the same group as milk, lettuce, white cabbage, and carrot (5 to 10 in terms of yeast 100) and the apple, orange, and tomato with potato and turnip (2.5 to 5).

The effects of coprophagy in rats deprived of the vitamin B complex, M. H. Roscoe (*Biochem. Jour.*, 25 (1931), No. 6, pp. 2056–2067, fig. 1).—This paper reports a study of coprophagy in rats deprived of vitamin B (B_1) and vitamin G (B_2) as compared with deprivation of the entire vitamin B complex. An attempt was also made to determine the origin of the B vitamins acquired by simple coprophagy and refection.

On diets deficient in the vitamin B complex or either of its constituents and containing soluble starch, the life of the rats was considerably prolonged by coprophagy and in some cases growth also took place. The results were not altered by a preliminary week of deprivation during which coprophagy was not permitted. Each day the rats were offered all of the feces of the preceding day. The quantity consumed varied from 44 to 100 per cent. Growth did not occur when less than 70 per cent was consumed, but was not proportional to the increased consumption.

No definite conclusions were drawn concerning the origin of vitamin B as the result of coprophagy and of refection, although the two are considered not to be identical. It is suggested that in coprophagous rats there is a synthesis of the B vitamins, probably by bacteria in the lumen of the intestines. The bacteria, however, are not introduced into the intestines by the feces, as sterilized feces served equally well. The possibility is suggested that refection also involves a bacterial synthesis, but the same organism does not appear to be responsible in both cases.

Studies in the physiology of vitamins, XVI–XVIII (*Amer. Jour. Physiol., 98 (1931), No. 4, pp. 589–594; 99 (1932), No. 3, pp. 689–695; 101 (1932), No. 1, pp. 115–139, figs. 3*).—A continuation of the series noted previously (E. S. R., 66, p. 692).

XVI. *The effect of exercise on the time required for the development of the anorexia characteristic of lack of undifferentiated vitamin B*, G. R. Cowgill, H. A. Rosenberg, and J. Rogoff.—The theory first advanced by Cowgill and Klotz (E. S. R., 57, p. 488) that the vitamin B requirement for unit weight is a linear function of the ⅔ power of that weight or, in other words, that the vitamin requirement per unit of tissue mass is proportional to the metabolism of that mass, was tested on dogs by comparing the time required for the development of the anorexia characteristic of lack of vitamin B after forced exercise with that required after rest. Care was taken to "saturate the tissue reservoir" with the vitamin before beginning the experiment and to prevent coprophagy. In each of the 5 dogs used the period required for the development of anorexia was decreased during forced exercise by from one-third to one-half of the time required when the dogs were not exercised. These results are thought to support the theory advanced and also to confirm the observations of other investigators, showing a relationship between vitamin B and metabolism.

XVII. *The effect of thyroid administration upon the anorexia characteristic of lack of undifferentiated vitamin B*, H. E. Himwich, W. Goldfarb, and G. R. Cowgill.—The theory noted above was tested further by increasing the metabolism of 4 dogs by experimental hyperthyroidism with the following results:

"It was found that during hyperthyroidism (1) anorexia appeared in from one-half to two-thirds of the time required during the control period; and (2) the quantity of food ingested voluntarily per day was correspondingly increased. The total caloric intakes for the two experimental periods were approximately the same. This suggests that a definite relationship exists between a given amount of vitamin B and the katabolism of a definite quantity of foodstuffs. The 4 animals successfully maintained their weights by voluntary ingestion of food only when receiving sufficient amounts of vitamin B."

XVIII. *Measurements of the vitamin B requirement in several species of animals*, G. R. Cowgill.—In this paper data obtained by the author, with the collaboration of H. J. Deuel, jr., A. H. Smith, B. H. Klotz, and H. H. Beard, in an investigation begun in 1922 and noted occasionally from progress reports (E. S. R., 55, p. 295; 57, p. 488), have been assembled and discussed. The general plan of the investigation was to determine the quantities of the same vitamin B concentrate, yeast vitamin powder (Harris), required to maintain the normal urge to eat in animals differing widely in size and species, the ultimate object being the establishment of man's requirement for vitamin B. The experiments were completed in 1926, but with the accumulation of evidence that what had been considered vitamin B is made up of at least two factors, publication of the data was delayed until it had been quite definitely established that lack of antineuritic vitamin B is the chief if not the sole cause of the anorexia used as criterion in the various experiments.

Experiments on the pigeon, G. R. Cowgill and B. H. Klotz.—This has been essentially noted from another source (E. S. R., 57, p. 488). The formula for expressing the pigeon's requirement for vitamin B in terms of the concentrate used throughout the entire investigation is

$$\text{Pigeon: vitamin B (mg per day)} = 0.0037 \text{ weight }^{5/3} \text{ (g)}.$$

Experiments on the dog, G. R. Cowgill, A. H. Smith, and H. J. Deuel, jr.—Preliminary work on this phase of the investigation has been noted previously

(E. S. R., 54, p. 194). An extension of the study, with special emphasis on the minimum dosage of the concentrate required to maintain appetite, has led to the establishment of the adult dog's daily vitamin B requirement in terms of the same lot of yeast concentrate as

$$\text{Dog: vitamin B (mg per day)} = 0.000076 \text{ weight}^{5/3} \text{ (g)}.$$

Experiments on the rat, G. R. Cowgill and A. H. Smith.—The earlier experiments with this species (E. S. R., 55, p. 693) have been used to calculate a formula corresponding to those reported for pigeons and dogs. For rats ranging in weight from 80 to 160 g, the formula is

$$\text{Rat: vitamin B (mg per day)} = 0.0099 \text{ weight}^{5/3} \text{ (g)}.$$

Experiments on the mouse, H. H. Beard.—The conclusions drawn in the original paper on this species (E. S. R., 55, p. 293) were that the value of the exponent of the weight is 7/3 instead of 5/3. This figure is not accepted as final on account of the greater error in working with mice.

Comparison of data from different species, G. R. Cowgill.—In this final section an attempt has been made to interpret the mathematical expressions obtained for the different species. "Considerations were advanced favoring the view that the amount of antineuritic vitamin required to maintain the normal urge to eat is proportional to the total metabolism of the individual multiplied by a factor correcting for age. If individuals within a given species are being compared, another statement appears valid, namely, that the vitamin requirement per unit of mass, i. e., weight, is proportional to the metabolism of that mass, that is, the ⅔ power of the weight."

The author is of the opinion that these results also apply to man.

Experiments on nutrition.—XI, Comparative vitamin B_1 values of foodstuffs: Fruits and vegetables, R. H. A. Plimmer, W. H. Raymond, and J. Lowndes (*Biochem. Jour., 25 (1931), No. 5, pp. 1788–1800*).—Following the same technic as in other studies of the series (E. S. R., 67, p. 186), the authors have determined the vitamin B (B_1) content of various fruits and vegetables. These were ground and heated on a water bath until the material became of such consistency that it could be mixed with the ingredients of the basal diet, made into pills, and dried. The values obtained have led the authors to conclude that vegetables and fruits have no important value as sources of vitamin B (B_1) in the ordinary diet. In terms of dried yeast as 100, cereals 10, and pulses 13, the following values are given for the materials tested in terms of wet weight: Orange juice and orange peel 6, tomatoes, cabbage, water cress, artichokes, and leeks 5, parsnips 7, and potatoes 4.

On the function of torulin.—An in vitro effect of antineuritic vitamin concentrates, N. Gavrilescu and R. A. Peters (*Biochem. Jour., 25 (1931), No. 6, pp. 2150–2161, fig. 1*).—In the authors' opinion the experiments presented in this paper, if confirmed by further work, represent the first instance in which an effect of a vitamin has been demonstrated upon a tissue in vitro.

The evidence consisted in the demonstration that the oxygen uptake in glucose phosphate solution of finely minced tissue from the mixed optic lobes and lower parts of pigeon brains is much lower in the material from polyneuritic than normal pigeons and is increased by the addition of vitamin B_1 concentrates. The action, which is catalytic, is said to be inactivated by treating with alkali, as is the case with vitamin B_1. The effects were less consistently obtained with cerebral tissue, thus confirming the theory first expressed by Kinnersley and Peters (E. S. R., 64, p. 497) that the optic lobes and lower part of the brain are more directly connected with vitamin B_1

deficiency than the rest of the brain. "With the same part of the brain is associated especially the increase in lactic acid found by Kinnersley and Peters. Vitamin rapidly induces an increased rate of disappearance of lactic acid in the tissues of the avitaminous animal [as noted by Fisher (E. S. R., 67, p. 340)]. Realizing that there is still much that is not clear, the lesion seems evidently to affect the tissue metabolism of carbohydrate, a view which has been often mooted. Perhaps for the first time we obtain here experimental grounds for belief in the great importance of the antineuritic vitamin B_1 as such in the normal functioning of the central nervous system."

The blood-sugar level in vitamin B_1 deficiency, M. E. Bell (*Biochem. Jour., 25 (1931), No. 5, pp. 1755–1768, fig. 1*).—Preliminary to a reinvestigation of the problem of the nature of the reducing substances of the blood in vitamin B deficiency, comparisons were made between the Hagedorn-Jensen and Somogyi (E. S. R., 64, p. 713) methods of zinc hydroxide precipitation in human blood and pigeon blood, with the conclusion that the values obtained by the former method average 8 mg higher for human blood and from 16 to 32 mg higher for pigeon blood. Using the Folin-Wu filtrates for total sugar, the Somogyi for "true sugar," and the Herbert and Bourne unlaked filtrates for nonsugar, the reducing values for fasting adult pigeons' blood averaged 243, 182, and 62 mg per 100 c c, respectively. Corresponding values for vitamin B-deficient pigeons during convulsions were 340, 290, and 58 mg per 100 c c, respectively, thus showing a marked increase in the true sugar, but no increase in the nonsugar reducing substances.

In normal rats the average values for total sugar, true sugar, and nonsugar reducing substances were 109, 76, and 29 mg, respectively. In vitamin B-deficient rats in convulsions the values were 97, 67, and 32, without convulsions 101, 73, and 28, and in a moribund state 77, 42, and 27 mg per 100 c c, respectively. These results are contrary to the findings of Sure and Smith (E. S. R., 62, p. 896) of no increase in the nonsugar reducing values of the blood of vitamin B-deficient rats, but in agreement with their findings of no increase in true sugar. Attempts to account for the discrepancy between these findings and the report of Drummond and Marrian (E. S. R., 56, p. 694) of hyperglycemia in rats during vitamin B deficiency led to the discovery that when blood is obtained from the hearts of rats which have been rapidly killed by dislocation of the neck (as was the case in the technic of Drummond and Marrian) it has a higher sugar content than circulating blood obtained from the tail immediately before death.

The author suggests that the hyperglycemia in pigeons is "the result of nervous stimulation—something of the nature of the hyperglycemia of asphyxia, anesthesia, or diabetic piqûre. Its failure to occur in convulsive rats is ascribed to exhaustion of glycogen stores."

The rôle of certain dietary factors in the formation of erythrocytes, B. C. Guha and L. W. Mapson (*Biochem. Jour., 25 (1931) No. 5, pp. 1674–1686, figs. 6*).—This investigation was undertaken originally to determine the possible relation between vitamin B_2 and erythrocyte count as suggested by the occurrence of both vitamin B_2 and the factor specific for pernicious anemia in liver, and was extended to cover various other points, including the effect of vitamin B_2 on red cell count; of copper, iron, and glutamic acid on the erythrocyte count in vitamin B_2 deficiency; of iron intake in vitamin B_2 deficiency and other dietary factors concerned in the production of erythrocytes; and the effect of vitamin B_1 deficiency on red cell count. Both albino and piebald rats were used as experimental animals. The blood counts were taken with the Bürker hemocytometer, and the Haldane method was used for estimations of

hemoglobin. The vitamin B_1 and B_2 preparations and aqueous liver extracts free from vitamin B_2 were obtained as previously described (E. S. R., 66, p. 707; 67, p. 188). The copper sulfate, ferric chloride, and glutamic acid were administered in aqueous solution in doses furnishing 0.05, 0.5, and 50 mg, respectively.

Animals suffering simple vitamin B_2 deficiency showed a small but distinct reduction in red cell count which could be corrected by alkaline autoclaved marmite (furnishing vitamin B_2), but not by copper, glutamic acid, or additional iron. Food records showed that although there was a distinct reduction in food intake, the basal diet furnished sufficient iron to cover the iron requirement, thus refuting the claim of Bliss (E. S. R., 64, p. 595) that vitamin B_2 deficiency is a simple iron deficiency. The administration and withdrawal of autoclaved marmite were followed by a perceptible rise and fall in red cell count. This was also true to an even more marked extent of autoclaved liver extract, which contains no vitamin B_2.

In other series of experiments it was also shown that, while autoclaved marmite has a noticeable effect on red blood cell count, the effect of autoclaved liver extract was still more marked and that of copper, glutamic acid, and alkaline hematin negative. On a combination of the liver extract with autoclaved marmite the red cell count showed a tendency to fall.

Somewhat higher figures for red cell and hemoglobin concentration were obtained when the basal diet was supplemented with yeast than with vitamin B_1, and still higher figures when autoclaved liver extract was added. There appeared to be no reduction in red blood cell count in vitamin B_1 deficiency.

In discussing the significance of these findings, the conclusion is drawn that liver contains a heat-stable factor not identical with vitamin B_2, which exerts a powerful influence on the formation of erythrocytes. Whether the factor in autoclaved marmite which is capable of restoring red blood cell concentration to normal is vitamin B_2 or the same factor as present in the autoclaved liver has not yet been determined.

Concerning the disputed question of the etiology of pellagra, the possibility is suggested that vitamin B_2 may be concerned with some phase of the mobilization of ingested iron. In this connection it is noted that some of the vitamin B_2-deficient animals which were receiving vitamin B_1 and autoclaved liver extract lost fur more readily than those receiving vitamin B_1 only, "suggesting that the liver principle might hasten depilation by mobilizing most of the available iron for the generation of blood, when the food intake and, therefore, the iron intake is limited."

Investigations on the determination of vitamin D.—Comparison between the preventive and the curative methods, P. Schultzer (*Biochem. Jour.*, 25 (1931), No. 5, pp. 1745–1754).—The author reviews and discusses the various methods in use for the quantitative determination of vitamin D, and presents data on a comparison, using the same cod-liver oil, of preventive methods in which X-ray examinations and autopsy findings are used as criteria with the curative method involving the line test technic. Bone analyses were included in both methods.

On the basis of these comparisons, the conclusion is drawn that the preventive method is superior to the curative. Bone analyses were considered to give no different or more uniform results than those obtained by X-ray examination and autopsy.

Ultraviolet radiation needed to cure rickets with respect to area of skin exposed, A. Knudson (*Soc. Expt. Biol. and Med. Proc.*, 29 (1931), No. 3, pp. 314, 315).—In this preliminary report irradiation experiments on rats are

noted briefly, showing that rickets can be cured by exposure of only a very small surface of the skin to ultra-violet light, that the quantity of radiation needed to cure rickets is directly proportional to the area of the skin exposed, and that the same quantity of radiation is equally effective when given in a few larger doses at longer intervals as when given in smaller doses at more frequent intervals.

TEXTILES AND CLOTHING

The development of rayon, M. GRIFFITH and G. S. COOK (*Ohio Sta. Bimo. Bul. 157 (1932), pp. 131–135*).—The history and process of manufacture of rayon are briefly summarized.

HOME MANAGEMENT AND EQUIPMENT

The quality of living in Montana farm homes, J. E. RICHARDSON (*Montana Sta. Bul. 260 (1932), pp. 45+XVI, figs. 20*).—This bulletin is based upon information obtained by interviews with and accounts kept by 40 families in 7 counties in 4 sections of the State. Thirteen owner, 19 part owner, and 8 tenant families were included. Tables and charts are included and discussed showing, by the counties, the size of farms; gross cash income; total cash expenditures; cash expenditures, total and per person, for home living; and the distribution of cash expenditures and the value of items furnished by the farms for food, clothing, housing, house furnishing and equipment, operation, personal needs and health, and advancement. Comparisons are made of the findings with those for other States.

The average costs per household of 4.5 persons were as follows: Food $945.69, clothing $189.37, house furnishing and equipment $114.79, operation $157.54, health and personal needs $110.91, advancement $174.96, and housing $226, a total of $1,919.27, of which $604.32 was for produce furnished by the farm.

The cost in Montana ranked favorably with that of groups in other States recognized as having a satisfactory quality of living.

[Studies in home management and equipment] (*Indiana Sta. Rpt. 1931, pp. 38–40, fig. 1*).—This progress report notes tests of electric and gas range ovens, a summary of data as to typical rural Indiana kitchen arrangements, and a continuation (E. S. R., 65, p. 191) of studies of home canning methods in which there was found a slower rate of heat penetration in oven processing as compared with water-bath processing of fruits and vegetables.

The cooking of food with heat generated by the resistance of the food to the passage of an alternating electric current, L. E. SATER (*Jour. Home Econ., 23 (1931), No. 11, pp. 1050–1054*).—Essentially noted from a progress report (E. S. R., 65, p. 196).

The relation of draft to performance of kerosene burners on kerosene cook stoves (*Nebraska Sta. Rpt. [1931], p. 23*).—Progress results are presented.

MISCELLANEOUS

Report of the [California] Agricultural Experiment Station, [1931], C. B. HUTCHISON (*California Sta. Rpt. 1931, pp. [1]+118, figs. 3*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Report of the director [of Connecticut State Station] for the year ending October 31, 1931, W. L. SLATE (*Connecticut State Sta. Bul. 337 (1932),*

pp. 449–493, figs. 11).—The experimental work reported and not previously referred to is for the most part noted elsewhere in this issue.

[Annual Report of Florida Station, 1931], W. NEWELL ET AL. (*Florida Sta. Rpt. 1931, pp. 184+XI, figs. 19*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue. Meteorological data at the Everglades Station (pp. 130, 131–134) and at Quincy (p. 180) are also reported.

Forty-fourth Annual Report of [Indiana Station], 1931, J. H. SKINNER and H. J. REED (*Indiana Sta. Rpt. 1931, pp. 87, figs. 18*).—The experimental work not previously referred to is for the most part abstracted elsewhere in this issue.

The Forty-fourth Annual Report of the Maryland Agricultural Experiment Station, [1931], H. J. PATTERSON (*Maryland Sta. Rpt. 1931, pp. XXXVII+482+[2], figs. 114*).—The experimental work here reported and not previously referred to is for the most part noted elsewhere in this issue. Bulletins 321–328, previously noted, are appended.

Forty-fifth Annual Report of [Nebraska Station, 1931], [W. W. BURR] (*Nebraska Sta. Rpt. [1931], pp. 52*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Agricultural research in New Hampshire: Annual report of the director of the New Hampshire Agricultural Experiment Station for the year 1931, J. C. KENDALL (*New Hampshire Sta. Bul. 262 (1932), pp. 30*).—The experimental work not previously noted is for the most part abstracted elsewhere in this issue.

Fifty-second Annual Report of the New Jersey State Agricultural Experiment Station and the Forty-fourth Annual Report of the New Jersey Agricultural College Experiment Station for the year ending June 30, 1931, J. G. LIPMAN ET AL. (*New Jersey Stas. Rpt. 1931, pp. XXIX+386, figs. 33*).—The experimental work not previously referred to is for the most part abstracted elsewhere in this issue.

Report of the Porto Rico Agricultural Experiment Station, 1931, T. B. MCCLELLAND ET AL. (*Porto Rico Sta. Rpt. 1931, pp. [2]+27, figs. 8*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Report of the Virgin Islands Agricultural Experiment Station, 1931, J. R. RICKS ET AL. (*Virgin Islands Sta. Rpt. 1931, pp. [2]+21, figs. 9*).—The experimental work reported is for the most part noted elsewhere in this issue. A soil survey in St. Croix by J. Thorp and meteorological observations there by A. Bisserup are also included.

Abstracts of Bulletins 421–441, Circulars 59–60, and other publications during 1931, A. D. JACKSON (*Texas Sta. Circ. 61 (1931), pp. 39*).—The various publications here abstracted not previously referred to are for the most part noted elsewhere in this issue. An article entitled Chlorophyll Deficiencies Induced in Cotton (*Gossypium hirsutum*) by Radiations, by W. R. Horlacher and D. T. Killough (pp. 27, 28), is also included.

NOTES

Alabama Polytechnic Institute.—The resignation is announced of President Bradford Knapp, effective September 1, following his acceptance of the presidency of the Texas Technological College at Lubbock.

Colorado Station.—Dr. C. P. Gillette has retired as director and has been succeeded by Dr. E. P. Sandsten, professor of horticulture and horticulturist.

Florida Station.—Recent studies have shown the cause of the bitter taste developed in prepared citrus juices on standing, the causes of changes in color, and a method of preventing settling or rising of solid particles in the juices. The bitter taste was found to be due to certain glucosides present in the inner peel, the veins, and the walls lining the sections of the fruit. When the juices are extracted in such manner that the parts containing these glucosides are little disturbed, the bitter taste does not develop. The change which takes place in the color of the juice has been traced to citrus oil. The addition of this oil to the juice mixture causes a change in color from the original to lighter shades. Since color of the right shade is distinctly worth while in high grade juice, the blending of tangerine juice with sweet orange juice is suggested. Earlier work at the station has shown this to be one of the most satisfactory citrus juices known. The rate of settling of the solids in citrus juice appears to be definitely affected by the size of the particles, the smaller particles remaining in suspension longer. Also it has been determined that the presence of small amounts of citrus oil causes the particles to remain in suspension longer. Sufficient amounts of citrus oil will cause all the particles to rise.

Samuel Todd Fleming, assistant director since 1926, died July 31 at the age of 49 years. He was a native of Florida and a graduate of the university. He had specialized in agricultural economics and statistics and served as agricultural statistician in charge of the Florida office of the U. S. D. A. Division of Crop and Livestock Estimates from 1918 to 1925. His work at the station had dealt largely with problems of administration, for which he had developed much aptitude and capacity.

Georgia Station.—W. D. Armstrong, assistant in horticulture in the Kentucky Station, has been appointed assistant horticulturist beginning July 5.

Guam Station.—Following the closing of this station on July 1 as previously noted (E. S. R., 67, p. 353), Director C. W. Edwards was transferred to the U. S. D. A. Bureau of Animal Industry as associate animal husbandman and with headquarters at the Iberia Livestock Experiment Farm at Jeanerette, La.

Kansas College and Station.—The construction of a new college dairy barn has been authorized by the board of regents under an allotment which has been reduced from $60,000 to $45,000.

Graduate work leading to the Ph. D. degree in bacteriology, chemistry, entomology, and milling industry has been authorized.

Dr. C. L. Lefevre has been appointed assistant professor of botany on a 12 months' basis, including both station work and college teaching.

Kentucky Station.—The resignations are noted of Genevieve Farwell, technician in the department of animal pathology, and Fred Boyd, assistant

in rural life studies. Encil Deen, inspector in the feed control, has been transferred as seed inspector in the department of entomology and botany.

Louisiana Stations.—The special State appropriation for sugarcane investigations has been discontinued, but in lieu thereof the amount provided by the university has been increased from $60,000 to $100,000. It is expected that this change will give greater stability to this phase of the station work.

A reconnaissance survey of the rice soils of the State is being made for the purpose of enabling the station to locate fertilizer tests beginning next year on the different soil types of the area.

Don E. Ellis, assistant in plant pathology, and M. B. Sturgis, assistant soil technologist, have been transferred to rice investigations. C. L. Stracener, assistant in entomology, will also devote his time hereafter to studies of insects affecting rice.

Mississippi Station.—J. R. Ricks returned to the station on September 1 as director and will also serve as dean of the School of Agriculture. Dr. C. B. Cain after 18 months spent at Rockefeller Institute has returned as veterinarian, and will conduct research problems in animal pathology. C. B. Anders has completed a two-year leave for advanced study at the University of Maryland and has returned to the agronomy department.

Rutgers University and New Jersey Stations.—The James Turner Research Institute, which is the North Jersey Branch of the stations, has completed the construction of modern barns, a hay dehydrator, silos, etc. Some new features in dairy herd management have been introduced in the construction of these buildings. The present research program of the institute includes pasture management studies, nutrition, breeding, and the control of diseases and parasites of dairy animals.

A patent has been granted to the stations under the recent Federal law on one of the new peaches developed at the institution. Among the seedling peaches which have come into bearing, the Golden Jubilee has brought very gratifying returns in commercial orchards.

The death is noted of Edith D. Dixon, extension specialist in child training and parent education, on May 5 and of Frank W. Miller, associate entomologist in mosquito work, on June 8.

Dr. Sante Mattson, professor of soils and associate soil chemist, has resigned to accept an appointment as professor of soil chemistry in the University of Uppsala, Sweden. Other resignations include Dr. Hettie M. Chute as research assistant in botany, Joseph G. Falconer as research assistant in soil microbiology, Donald F. Chichester as research assistant in agricultural biochemistry, Dr. John A. Small as seed inspector, John W. Goodman as assistant poultry husbandman, and Harold Robertson as assistant extension horticulturist.

Henry J. Miles has been appointed research assistant in water and sewage investigations. Dr. Walter L. W. Kubiena of the Hochschule für Bodenkultur at Vienna, Austria, has been appointed Cook-Voorhees research fellow in soil science, beginning October 1.

Cornell University and Station.—Dr. Carl E. Ladd has been appointed director of the station as well as dean of the Colleges of Agriculture and Home Economics. L. R. Simon, State leader of county agents, has been appointed to succeed him as director of extension work in these colleges. Dr. Ruby Green Smith has been appointed State leader of home demonstration agents to fill the vacancy caused by the death of the late Martha Van Rensselaer.

EXPERIMENT STATION RECORD

'ol. 67 December, 1932 No. 6

EDITORIAL

THE AGRICULTURAL EXPERIMENT STATIONS IN 1931

Another of the annual reports of the Office of Experiment Sta- tions on the agricultural experiment stations of this country has now become available. Compiled to cover the fiscal year ended June 30, 1931, this rep ike those of previous years, reviews the work and expenditures e stations in the several States and in Alaska, Guam, Hawaii, uerto Rico, and the Virgin Islands. It recapitu- lates the major developments of the period and brings together much statistical and other information regarding finances, personnel, facil- ities for research, projects and cooperation, publications, and other matters relating to the organization, administration, and develop- ment of the work of the stations. A review occupying nearly 100 p ges epitomizes their outstanding contributions to the science and practice of agriculture and the betterment of rural life.

The year's record, it is brought out, was one of substantial progress. Despite the unfavorable economic conditions generally prevailing throughout the country, their total income continued to increase and their funds were utilized to a greater extent than ever before in specific projects providing for more intensive and productive research.

The aggregate income of the stations for the year was $18,056,282, a larger amount than ever before, and exceeding by $145,158 the total for the previous year. The Federal contribution remained sub- stantially unchanged at $4,340,000, while from other than Federal sources there was derived $13,466,082, or 74.5 per cent of the whole. A sustained interest by the States themselves is clearly indicated y this showing, nearly half of the stations reporting increases in eir supplementary funds, in some cases in substantial amounts, le in only a few instances were the decreases significant.

he expanding activities of the experiment stations and the in- g complexity of their work call for constant improvement ension of facilities for research. During the year the per- onnel associated with the stations increased from 3,254 to 3,419. M y additions were also made to lands, buildings, laboratories, and v ous special forms of station equipment, aggregating $2,565,317 and representing an increase of $275,918 over this expenditure for the preceding year.

On the basis of receipts by this Office, the publications in th regular station series numbered 881 in 1930 and 931 in 1931. I addition 64 articles were contributed to the *Journal of Agricultur Research* and 1,717, a gain of 359, appeared in 69 technical an scientific journals. This substantiates the claim made in the repo that "the volume and variety of station publications are increasin from year to year." It is also evident that the gain was not merel quantitative. As the report points out, "progress is being made no only in securing greater scientific recognition, but wider practica application of the results of station work. It is evident that th publications are being more carefully prepared these ends i view."

Although the report makes it clear that practi ll of the wor of the stations is now being conducted on a projec , no computa tion of the aggregate number of these projects is attempted. At th close of the year, however, there were active 398 Adams projects and 1,241 Purnell projects. An unusual amount of attention is reported to have been given to the revision of projects and the recasting of research programs. "Projects, particularly those supported by Adams and Purnell funds, were made more specific in plan and purpose, many were completed and closed, and research programs were relieved of unprogressive and unproductive projects. More discrimination than heretofore is also being exercised in selecting problems for study."

Detailed consideration is given to the status of economic and sociological research along lines previously discussed in these columns (E. S. R., 66, p. 301), as well as to the important subject of coopera tion in research. On the latter topic, it is found that "cooperation between groups of stations having common problems, between the stations and other State agencies, and between the stations and the Federal Department of Agriculture made distinct progress during the year. This is shown not in number of cooperative agreements entered into, but in the refinement of the projects involved, the rounding out of research programs, and the more discriminating selection of problems for study."

Every experiment station cooperated with the Federal Departm of Agriculture, the number of cooperative agreements per sta ranging from 2 to 59. The total number of such agreements 7 and while this was 16 per cent fewer than during the previou r the decrease is attributed not to declining interest in coop on but to "completion of certain studies and revision of resear ro- grams resulting in consolidation of several cooperative studies into larger undertakings of broader significance."

In a section on costs and benefits, it is stated that the financial support of the stations from Federal, State, and other sources "has been liberal and amounts in the aggregate to a large sum." The annual cost of the stations, however, is computed to be only about 15 cts. per capita for the population of the United States, and the benefits from their work are believed to far exceed the cost. "There is abundant evidence that station work is returning to the public many times its cost in improved methods of soil maintenance, better crop plants and methods of culture originated by the stations, more efficient methods of controlling insect pests and plant diseases, better methods of breeding, feeding, and management of farm animals, more effective control of animal diseases, better methods of farm management and marketing of farm products, and in many other ways. The results of station investigations on vitamins, mineral requirements in nutrition, and effect of light have had a profound influence on feeding and dietary practices; many improved varieties of crop plants, fruits, and vegetables have been originated or introduced by the experiment stations and the United States Department of Agriculture and have replaced older and less desirable varieties; the great wheat-growing industry of the United States is to a large extent based on improved varieties developed or introduced by the experiment stations and the Department of Agriculture; cotton growing has survived the boll weevil largely because of efficient methods of controlling the pest and improved methods of culture resulting from investigations by the stations and the Department; orchard culture has been vastly improved as a result of investigations on cover crops, improved varieties, pruning, grafting, and spraying; the Babcock test and the improved methods which it made possible have revolutionized the dairy industry; and losses due to such destructive diseases of animals as infectious abortion in cattle, pullorum disease of fowls, and many others have been greatly reduced as a result of the work of the stations and the Department."

This summary is necessarily incomplete, but it includes many achievements for which the economic returns involve millions of dollars each year. It is also important to remember that, as the report makes clear, the benefits "are not confined to the rural population, but accrue to all the people and all the industries of the country."

FEDERAL APPROPRIATIONS FOR AGRICULTURAL RESEARCH

The total appropriations for agricultural research and related activities under funds expended or administered by the Federal

Department of Agriculture for the fiscal year ending June 30, 1933, aggregate $21,259,944. This includes $16,885,994, recently estimated in *The Official Record* as allocated to the Department itself for this purpose, and $4,374,000 for payments to the States and Territories for research under the Hatch, Adams, and Purnell Acts.

Considerable as are these sums in the aggregate, they represent less than 11.4 per cent of the total appropriations embodied in the so-called " permanent legislation " or carried in the annual act caring for the Department. As in previous years, this legislation, while bearing the Department's name and very naturally often regarded by the general public and others as representing the Government's contribution to agriculture, contains no less than $109,405,000 of its total of $186,883,236 for payments for Federal-aid highways, forest roads and trails and other highway purposes, and an allotment of $1,000,000 for Federal participation in the 1933 Century of Progress Exposition at Chicago.

The allocations for research show a decrease of $2,004,418 from the comparable items of the previous year. This curtailment includes a reduction of $105,116 for the Office of Experiment Stations, mainly because of the changes in the insular experiment stations previously referred to (E. S. R., 67, p. 353). Other changes include decreases from $4,821,830 to $4,200,940 for the Bureau of Plant Industry; from $2,767,180 to $2,458,060 for the Bureau of Entomology; from $2,006,783 to $1,797,700 for the Bureau of Agricultural Economics; from $2,104,051 to $1,925,080 for the Bureau of Chemistry and Soils; from $1,819,925 to $1,686,740 for the Forest Service; from $502,512 to $395,000 for the Bureau of Public Roads; and from $781,010 to $701,468 for the Bureau of Dairy Industry. For the remaining bureaus the reductions are under $50,000 each, the Weather Bureau receiving $200,350, the Bureau of Animal Industry $1,239,335, the Bureau of Biological Survey $330,593, the Bureau of Agricultural Engineering $618,690, and the Bureau of Home Economics $233,365.

The amounts actually available for expenditure under these allotments will also be curtailed under extensive legislation contained in the Economy Act, approved June 30, 1932. Among other provisions this act requires the retention in the Treasury of at least one month's salary from all employees of the Department. Estimating the amount thus rendered unexpendable at $1,000,000, the Department's effective allotment for research becomes less than $16,000,000. This is probably not far from the amount which will be available to the State experiment stations from all sources for the same period. The total per capita expenditure for agricultural research for the year by both State and Federal agencies will evidently be less than 30 cts. It is a much smaller outlay than is sometimes supposed.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Bibliography of bibliographies on chemistry and chemical technology.—Second supplement, 1929–1931, *compiled by* C. J. West *and* D. D. Berolzheimer (*Bul. Natl. Research Council, No. 86* (*1932*), *pp. 150*).—This is a second supplement to the Research Council's Bulletin No. 50 (E. S. R., 54, p. 707), to which the first supplement appeared as Bulletin No. 71.[1]

[Work of the Wisconsin Station in bacteriological chemistry] (*Wisconsin Sta. Bul. 421* (*1932*), *pp. 92–96, figs. 3*).—Results are included of studies by E. B. Fred, W. H. Peterson, et al. on the growth of high temperature cellulose fermenting bacteria and various mold fermentations, and of trials of the benefit of washing cabbage for sauerkraut.

On the effect of iron upon the citric acid fermentation of Aspergillus niger [trans. title], A. Quilico and A. Di Capua (*Gior. Chim. Indus. ed Appl.*, *14* (*1932*), *No. 6, pp. 289–293, figs. 2*).—The effects of the presence of small quantities of iron compounds on the citric acid fermentation of sugar solutions by two strains of *A. niger* are reported and discussed. A laboratory-grown strain of the fungus was shown to be so sensitive to the effect of iron compounds that a few drops of 0.1 N. ferric chloride solution in 100 c c of the culture medium practically inhibited the formation of citric acid. On the other hand, a strain employed in the industrial production of citric acid was distinctly benefited, with respect to its capacity for citric acid production, by small additions of the iron salt, insomuch that the quantity of the acid formed increased markedly with the iron content of the culture medium. The experiments are considered to demonstrate the great influence of the variations among strains of the fungus used upon the course of the citric acid fermentation as induced by *A. niger*.

Egg-yolk proteins, T. H. Jukes and H. D. Kay (*Jour. Nutrition, 5* (*1932*), *No. 1, pp. 81–101*).—This literature review, which includes a bibliography of 111 titles, deals with the isolation of egg-yolk proteins, chemical characteristics and physical properties of egg-yolk proteins, yolk proteins in nonavian eggs, the proteins of white and yellow yolk, iron and egg-yolk proteins, phosphorus and egg-yolk proteins, the nutritional value of egg-yolk proteins, and the effect of diet on the composition of the hen's egg yolk.

***Observations on the function of peroxidase systems and the chemistry* of the adrenal cortex. Description of a new carbohydrate derivative,** A. Szent-Györgyi (*Biochem. Jour., 22* (*1928*), *No. 6, pp. 1387–1409, pl. 1*).—This paper is divided into four parts dealing, respectively, with the function of peroxidase in the plant, the chemistry of the adrenal cortex and the isolation of a hexuronic acid, the isolation of the hexuronic acid from plants and some observations on the chemistry of the reducing factor, and observations on the oxidation and reduction of the hexuronic acid.

[1] Bul. Natl. Research Council, No. 71 (1929), pp. 161.

A rather wide range of experimental work included the isolation, first from the adrenal cortex and then from plant material (oranges and cabbage), of a highly reactive isomer of glycuronic acid, hitherto unknown. This hexuronic acid was shown to possess a definite reduction potential, undergoing a reversible loss of two hydrogen atoms on treatment with mild oxidizing agents. It was found auto-oxidizable, and capable of irreversible oxidation by molecular oxygen, with the formation of additional carboxyl groups. The auto-oxidation was strongly catalyzed by copper, only slightly by iron and by manganese, and it was inhibited by cyanide. The behavior of the substance in several biochemical oxidation systems is described. The oxidized hexuronic acid was found to be reduced strongly by animal tissues. "The dehydrogenases of the type of the Schardinger enzyme and the succinodehydrase are unable to reduce the oxidized hexuronic acid. The oxidized substance is reduced by the Hopkins glutathione system. Glutathione and fixed —SH strongly reduce the oxidized acid."

The relation of cellulose to lignin in wood, K. Freudenberg (*Jour. Chem. Ed., 9 (1932), No. 7, pp. 1171–1180, figs. 7*).—"The study of chemical characteristics, supplemented by microscopic investigation with ordinary and polarized light and by X-ray analysis, furnishes the basis for a wood-fiber model depicting the cellulose as forming homogeneous micelle series or fibrils about 600 a. u. thick, embedded in but not chemically combined with lignin."

The paper takes up the chemical constitution of cellulose, the chemistry of lignin, and the morphology of spruce wood, and concludes with a description of a model constructed at an assumed magnification of 100,000 and designed to represent the chemical and physical theory developed in the preceding part of the paper. A bibliography of the author's papers on cellulose and lignin follows.

Action of radio-active substances on vitamins, A. G. Hogan, C. L. Shrewsbury, G. F. Breckenridge, and W. S. Ritchie (*Jour. Nutrition, 5 (1932), No. 4, pp. 413–420, fig. 1*).—This contribution from the Missouri Experiment Station contains the complete report of observations noted from a preliminary report (E. S. R., 66, p. 390) of the destructive action of radioactive materials, radiothorium and mesothorium, on vitamin A as present in butterfat, with evidence that the activity resides in the beta rays. It is also noted briefly that vitamins B, C, D, and G are not inactivated by beta or gamma rays.

The interpretation of the colour match in the antimony trichloride test for vitamin A, R. S. Morgan (*Biochem. Jour., 26 (1932), No. 2, pp. 377–380*).—The author suggests as an explanation of the observation of Coward et al. (E. S. R., 67, p. 200) of lower blue values in the antimony trichloride test for vitamin A of potent oils than of the corresponding unsaponifiable fractions the interference in the former of other colors, particularly red. Evidence is presented in proof of this, and it is also shown that the value for blue — yellow remains constant in spite of variations in the red. For this reason it is suggested that the value blue — yellow would be a better criterion of vitamin A than the blue value as usually read.

Carotene and vitamin A, B. Woolf and T. Moore (*Lancet [London], 1932, II, No. 1, pp. 13–15*).—This note contains a brief summary in tabular form of the distinguishing properties of carotene and vitamin A and a criticism in the light of these properties of the claim of Olcott and McCann (E. S. R., 66, p. 607) and the tentative claim of Bowden and Snow (E. S. R., 67, p. 500) to have transformed carotene into vitamin A in vitro. Both claims are considered to be based on inadequate evidence. In the opinion of the authors a strong case for the production of vitamin A from carotene would be made out provided it

were shown "(1) that the carotene color was markedly diminished; (2) that the biological activity was definitely greater than that due to the unchanged carotene, as measured by the residual yellow color; (3) that the 328 mμ absorption band was present in an intensity corresponding to the biological activity; (4) that the $SbCl_3$ reaction was obtained, with absorption at 620 mμ, in an intensity corresponding to the biological activity; (5) that the conditions were not incompatible with the formation from the hydrocarbon, carotene, of an alcohol of lower molecular weight."

Presence of carotenase in the liver of the dog, A. C. Pariente and E. P. Ralli (*Soc. Expt. Biol. and Med. Proc.*, 29 (1932), No. 9, pp. 1209, 1210).—Following the report of Olcott and McCann (E. S. R., 66, p. 607) on the conversion of carotene to vitamin A in vitro by a rat liver extract which they believed contained an enzyme, carotenase, the authors attempted to prepare carotenase from the livers of normal and vitamin A-deficient dogs. In the one successful attempt out of four, it was noted that much of the blood had remained in the liver. This suggested that the preservation of the enzyme in this instance may have been due to the buffer action of the blood. Liver extracts prepared with a phosphate buffer solution of pH 7.4 instead of distilled water proved capable of converting colloidal carotene into vitamin A, as determined by the antimony trichloride test. The enzyme was destroyed by exposure to cold, but its activity was retained at 37° C. The technic for the preparation of the enzyme is described.

A new technique for the preparation of vitamin A-free casein, M. T Potter (*Science*, 76 (1932), No. 1965, pp. 195, 196).—In this brief contribution from the Washington College Experiment Station, the author recommends as a time-saving feature in the preparation of basal vitamin A-free diets the purification of the casein by heating in thin layers in air at a temperature of 110° C. for seven days in place of the more laborious alcohol extraction method usually followed. Depletion and positive and negative control records in vitamin A experiments are reported to establish the reliability of the air-heated form of casein for the basal diet in vitamin A studies.

The antineuritic vitamin.—III, Removal of impurities by fractional precipitation, R. J. Block and G. R. Cowgill (*Jour. Biol. Chem.*, 97 (1932), No. 2, pp. 421–431).—This continuation of the series of papers noted previously (E. S. R., 67, p. 503) reports further modifications of the authors' method of concentrating vitamin B (B_1), together with attempts to purify still further the concentrate obtained by the method as previously described and tests of the concentrate on species other than the pigeon previously used.

It was found possible to apply the carbon tetrachloride procedure directly to dilute hydrochloric acid extracts of rice polish and yeast without first removing vitamin B_2 (G) by adsorption on fuller's earth. In describing the technic attention is called to the destructive action of acetic acid, particularly the anhydride, on vitamin B. In the oxidation procedure, as described in the previous paper, it was found that the ratio of the original vitamin solution to the ethyl alcohol-carbon tetrachloride mixture may vary from 0.5 to 5 and the acidity of the concentrate from below pH 1 to pH 4 without affecting the potency of the concentrate, and that the addition of a few cubic centimeters of hydrogen peroxide to the vitamin solution during the removal of the organic solvents and excess hydrochloric acid results in a slightly purer concentrate.

Attempts to remove amino nitrogen by treatment with nitrous acid during the carbon tetrachloride procedure were unsuccessful, as destruction of the vitamin took place at the relatively high concentration of nitrous acid required. These results are thought to confirm the conclusion of Sherman and Whitsitt

(E. S. R., 65, p. 311) that vitamin B is resistant to the action of nitrous acid except when the treatment is very drastic.

Attempts were made to purify the vitamin as picrate, flavianate, or rufianate by the use of a mixed solvent of ether and butyl alcohol. Only a small amount of the vitamin was extracted in the presence of picric acid and rufianic acid, but almost all of the vitamin appeared in the butyl alcohol-ether layer when flavianic acid was used. Unfortunately, however, a large proportion of the nitrogenous impurities was likewise extracted. Fractional precipitation with various organic solvents was tried with some success with carbon tetrachloride, ethylene chloride, dioxane, and acetone.

Out of about 50 inorganic salts tested, only cuprous chloride and mercuric nitrate gave satisfactory results. The action of cuprous chloride is considered of particular interest in view of the well-known precipitating action of cuprous salts on the sulfhydryl group and the finding by Windaus et al. of sulfur in their purified vitamin B_1 concentrate (E. S. R., 67, p. 101).

In the biological tests, dogs suffering from anorexia on a vitamin B-free diet showed a renewal of appetite following the oral or intravenous administration of the vitamin concentrate, and others in the state of paralysis were cured within a few hours by the injection of from 20 to 40 pigeon units of the concentrate.

Rats on a vitamin B-free diet supplemented with 0.2 pigeon unit per day of the vitamin concentrate, together with small amounts of vitamin B_1-free autoclaved yeast or a commercial liver extract, grew well and appeared normal. Others receiving the basal diet without the vitamin G supplement lost weight and died without developing skin lesions.

A brief report is given of a striking and rapid cure resulting from the parenteral administration of one of the concentrates to a woman who had failed to respond to any previous treatment for sprue. The concentrate was given by intramuscular injection, and the pain caused by the injection was such as to prohibit the clinical use of this concentrate except in extreme cases.

Chemical investigations on the antiscorbutic vitamin, I [trans. title], O. and A. Rygh and P. Laland (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, *204* (*1932*), *No. 1–2, pp. 105–111*).—Evidence is presented leading the authors to advance the hypothesis that narcotine is the precursor of vitamin C.

The evidence consisted in isolating narcotine from large quantities of orange and lemon juice, comparing the quantities in ripe and unripe fruit, and testing the isolated narcotine, with and without irradiation, as the source of vitamin C in prophylactic experiments on guinea pigs. It was found that the narcotine content of the fruit decreased on ripening, that nonirradiated narcotine did not prevent scurvy, and that the animals receiving irradiated narcotine did not become scorbutic although they died. The narcotine was isolated from the fruit juices by evaporating the juices to one-fifth their original volume in vacuo, removing the oils and phytosterols by repeated extraction with peroxide-free ether, drying the extract with sodium sulfate, and distilling it in an atmosphere of carbon dioxide and oxygen.

Chemical investigations on the antiscorbutic vitamin.—II, Narcotine and its derivatives as antiscorbutics [trans. title], O. and A. Rygh (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, *204* (*1932*), *No. 1–2, pp. 114–122, figs. 2*).—Of various derivatives of narcotine which were tested for antiscorbutic properties dimethylnornarcotine, nornarcotine, and especially methylnornarcotine proved capable of preventing scurvy in guinea pigs. It is also noted that in seeds germination converts narcotine into an antiscorbutic substance.

Experiments on the isolation of narcotine from various vegetables [trans. title], P. LALAND (*Hoppe-Seyler's Ztschr. Physiol. Chem., 204 (1932), No. 1-2, pp. 112-114*).—Narcotine was isolated from several unripe vegetables by a modification of the method described in the first of the two papers noted above. From 20 kg of tomatoes 20 mg of narcotine was obtained. The yields from the same quantities of other vegetables tested were cabbage 8 and potatoes 12 mg. No narcotine could be obtained from mountain cranberries, a fruit of very slight antiscorbutic properties. From 50 l of milk, after the removal of casein by acidification, a very small quantity of narcotine was obtained.

Hexuronic acid as the antiscorbutic factor, J. L. SVIRBELY and A. SZENT-GYÖRGYI (*Nature [London], 129 (1932), No. 3259 pp. 576, 577*).—Preliminary experiments are reported which suggest the probability that hexuronic acid, isolated by Szent-Györgyi as noted on page 645, is the antiscorbutic factor. In guinea pig feeding experiments which had been running 55 days at the time the report was made, 9 negative controls on the basal diet alone had died of scurvy at an average period of 26 days, while 8 positive controls on lemon juice, 10 on a mixed diet, and 10 receiving 1 mg of hexuronic acid daily were in good health and gaining weight steadily. On sacrificing 3 of the animals receiving hexuronic acid and 2 lemon juice, mild scurvy was found in the latter but no signs of scurvy in the former.

Notes by W. N. Haworth and by E. L. Hirst and R. J. W. Reynolds on the probable chemical nature of hexuronic acid as isolated from suprarenal glands are appended.

Hexuronic acid as the antiscorbutic factor, J. L. SVIRBELY and A. SZENT-GYÖRGYI (*Nature [London], 129 (1932), No. 3262, p. 690*).—Supplementing the above note, the authors state that the feeding experiments with hexuronic acid were continued to the ninetieth day, when the animals were killed and subjected to autopsy. Those receiving hexuronic acid showed no signs of scurvy and those receiving 1 c c of lemon juice mild scurvy. It is noted that the daily dose of hexuronic acid was of the same magnitude as the hexuronic acid content of the protective dose of lemon juice (1.5 c c), thus leading the authors to conclude that vitamin C is a single substance identical with hexuronic acid.

An appended note by S. S. Zilva states that the minimum effective dose of hexuronic acid reported above is no smaller than the minimum effective doses obtained by him and his associates with grossly contaminated fractions of lemon juice. This is thought to militate against the contention that vitamin C is hexuronic acid. It is considered of interest, however, that it is possible to prepare active fractions of the antiscorbutic factor from a definite animal tissue.

The chemical nature of vitamin C, C. G. KING and W. A. WAUGH (*Science, 75 (1932), No. 1944, pp. 357, 358*).—It is announced briefly that the concentration of vitamin C from lemon juice by the method of Svirbely and King (E. S. R., 66, p. 708) has been carried a step further by recrystallization from organic solvents (ethyl acetate and petroleum ether), and that the recrystallized substance corresponds in chemical and physical properties to the hexuronic acid described by Szent-Györgyi. Feeding experiments showed that 0.5 mg daily of these crystals protected growing guinea pigs from scurvy and maintained them in good condition.

Attention is called to the fact that the report of the isolation and synthesis of vitamin C by Rygh, as noted above, is not in accord with these findings. "It is perhaps sufficient to point out from his paper (a) that experimental animals receiving his synthetic o-diphenol derivative of narcotine in addition

to their basal vitamin C-free diet survived no longer than those receiving the basal diet only, and (b) that the animals receiving a partial supply of vitamin C in addition to the synthetic compound showed a physiological response not greatly different from that of the group which received only the partial supply of natural vitamin."

Isolation and identification of vitamin C, W. A. WAUGH and C. G. KING (*Jour. Biol. Chem., 97 (1932), No. 1, pp. 325–331, fig. 1*).—This continuation of the series of papers on the chemical nature of vitamin C (E. S. R., 66, p. 708) gives the experimental details of the study noted above from a preliminary report, leading to the conclusion that vitamin C has been isolated from lemon juice and that it is identical with hexuronic acid. The evidence leading to this conclusion is summarized as follows: "(1) Natural occurrence so far as studied (the protective level of 0.5 mg daily of our preparation corresponds with 0.5 mg of hexuronic acid estimated by Szent-Györgyi in 2 c c of orange juice), (2) oxidation by iodine and by Benedict's reagent (quantitative), (3) optical rotation ($[a]_D^{20} = +25° \pm 1°$), (4) acid titration equivalent (exact for the free acid), (5) C and H combustion, for $C_6H_8O_6$, (6) reversible formation of a lactone and a free acid, (7) typical crystal forms, (8) solubility in a number of organic solvents, (9) precipitation as a lead salt, (10) instability toward alkalies and oxidizing agents, (11) diffusion rate and electrical transference (McKinnis and King), (12) melting point (183–185°)."

The chemical identification of vitamin C, L. J. HARRIS, I. MILLS, and J. R. M. INNES (*Lancet [London], 1932, II, No. 5, pp. 235–237, fig. 1*).—The authors have tested the antiscorbutic properties of a sample of hexuronic acid, prepared by Szent-Györgyi from suprarenal glands, by the Höjer tooth structure method and by a curative method the technic of which is described in considerable detail.

Both tests were carried out in duplicate with controls on orange juice as the antiscorbutic. With the Höjer technic 2 mg of the hexuronic acid gave complete, 1 mg practically complete, and 0.5 mg only partial protection. The potency of the 1-mg dose corresponded roughly to that of 1 c c of orange juice, and the 2-mg dose had a slightly higher potency than 2 c c of the orange juice.

The curative or recovery technic was essentially as follows: Matched male guinea pigs weighing about 250 g each are placed on a basal diet of "bran 80 parts, oats 720, egg yolk 40, salts 8.4, cod-liver oil 1 per cent." For a preliminary period of about 10 days the basal diet is supplemented with 15 g daily of cabbage. Within 2 or 3 weeks after the removal of the cabbage, the animals which show early signs of scurvy without infection and have begun to lose weight evenly are given graded doses of the material to be tested. Others are given graded doses of orange juice, and still others are continued as negative controls on the scorbutic diet. If the supplement furnishes adequate vitamin C, growth is resumed at normal rate within a day or two. The minimum daily dose of the supplement needed to bring about a given increase in weight can thus be determined and compared with the amount of orange juice required to produce the same rate of gain. The method is said to be very satisfactory, with a little experience, and to have the advantage over the customary preventive method in being more rapid and consequently requiring less material.

Only enough of the hexuronic acid was available for three curative tests, but the results of these showed that hexuronic acid at a level of 2 mg had a curative effect equal to or slightly greater than 2 c c, but less than 5 c c of orange juice.

It is also noted briefly, without experimental data, that raw suprarenal cortex has a high antiscorbutic potency roughly proportional to its high content of hexuronic acid.

An addendum contains a brief report of the experiments of Rygh noted on page 648, but with negative results. The conclusion of Rygh that vitamin C is identical with certain narcotine derivatives is criticized.

The microscope-centrifuge and some of its applications, E. N. HARVEY (*Jour. Franklin Inst., 214 (1932), No. 1, pp. 1-23, figs. 19*).—The author of this contribution from Princeton University describes a device which makes possible the microscopic observation of the movements of minute particles in the contents of cells and other small objects during the high-speed centrifugation of the experimental material.

Essentially, a counterbalanced centrifuge arm carries a slide especially adapted for the purpose of holding the material to be examined against the powerful centrifugal force developed, together with a microscope objective and a reflecting prism which directs the image-forming rays to the axis of rotation, where a second prism turns the rays upward to a stationary eyepiece. Illumination taking place once only in each revolution and lasting only for a few microseconds, the image is rendered stationary and steady regardless of the velocity of the centrifuge. An effective light was provided by a condenser discharge in mercury vapor, the discharge being timed by a contact on the revolving element of the apparatus.

Photomicrographs of an onion root tip section showing chromosomes, the one made with the apparatus at rest and the other made during centrifugation at 4,000 r. p. m., show essentially the same degree of definition. Successive stages in the deformation of Chaetopterus eggs and of some similar materials are also shown in photomicrographs made with the new instrument.

"There are many other uses to which a microscope-centrifuge may be put, for example, a study of stresses in crystals and transparent substances by use of polarized light. Observation of any small object while whirling at the greatest possible speeds is so easily carried out that the centrifuge-microscope should be a most useful instrument in every laboratory."

A field and laboratory test on plant material for diagnosing phosphorus deficiencies, S. F. THORNTON (*Indiana Sta. Bul. 355 (1932), pp. 20, figs. 5*).—The author describes an adaptation of the Denigès ceruleomolybdate color reaction (E. S. R., 44, p. 611) to the testing of plant material. The use of plant material is considered to eliminate the difficulty, common to all direct tests of the soil for phosphate deficiency, arising from the fact that "no solvent has been found which will give a true indication of the availability of soil phosphorus under all conditions." The diagnosis of phosphorus deficiency by testing the phosphate content of the plant itself "is based on the assumption that plants well supplied with phosphorus will accumulate inorganic phosphate while plants growing under conditions of a deficient phosphorus supply will show no such accumulation."

Essentially, a sample of the green plant material amounting approximately to 1 g in the cases of plants having small stems, but about 1.5 g in the cases of such large stemmed plants as corn, is cut fine, mashed somewhat between the fingers, placed in a small vial, and treated with about 10 c c of the acidified solution of ammonium molybdate; and after vigorous shaking a very small crystal of stannous chloride is added. Five grades of color intensity are recognized; 0, colorless or yellow; 1, green; 2, bluish green; 3, light blue; 4, medium blue; 5, dark blue; and of these, 4 is taken to indicate a sufficient supply, 3 a doubtful supply, and below 3 a definitely deficient supply. The portion of the plant which should be used for the test is indicated in the cases of corn, wheat, oats, barley, rye, alfalfa, tomatoes, sugar beets, cabbage, and potatoes.

Results of carrying out the test in the station's experiment fields are shown in parallel-column comparison with the fertilizer treatments.

Evidence is also presented to show that the addition of relatively large amounts of muriate of potash increases the inorganic phosphorus supply maintained within the plant. "This may be due either to an increased absorption of phosphorus or to changes effected in its translocation or utilization."

A study of the Neubauer and Winogradsky (Azotobacter) methods as compared with a chemical method for the determination of phosphate deficiency in western soils, H. W. Dahlberg and R. J. Brown (*Jour. Amer. Soc. Agron., 24 (1932), No. 6, pp. 460–468, fig. 1*).—The Neubauer method (E. S. R., 53, p. 319) and the Azotobacter or Winogradsky method, employed at the Colorado Experiment Station by Sackett (E. S. R., 66, p. 612), were compared with a chemical method consisting essentially in the extraction of the soil with an acetate buffer (0.25 N sodium acetate, pH 5) and developing the Denigès color reaction (E. S. R., 44, p. 611) in the more strongly acid solution of ammonium molybdate stirred with a tin rod to effect reduction. This chemical method is described in working detail.

From the experiments thus far made "it apears that the chemical method is a very satisfactory substitute for the time-consuming Neubauer test on soils of the type investigated, and it possibly at least equals the Winogradsky test in accuracy. Since other chemical methods have been found unsatisfactory when applied to these soils, it appears possible that the acetate extraction method may not yield satisfactory results on other soils. Therefore, its use is not to be recommended on those soils in the absence of comparative results by other satisfactory methods."

Results of 101 tests are tabulated. Of these, 73 show the same result by the three methods. The results of the Neubauer and Winogradsky tests agreed in 83 cases, the Neubauer and chemical tests in 82 instances, and the Winogradsky and chemical tests in 75.

"The poorer agreement between the results of the Winogradsky and chemical tests is caused by a tendency of the Winogradsky to yield low results in soils of high available P_2O_5 content, while the chemical method tends to show some high results in soils of low P_2O_5 content. Since the three classifications of soils according to available P_2O_5 content are not equally represented in the samples tested, a better picture of comparisons is obtained by comparing the soils according to groups." This more detailed comparison is shown.

A comparison of the Niklas and Truog methods for the determination of available phosphorus in soils, F. B. Smith, P. E. Brown, and F. E. Schlots (*Jour. Amer. Soc. Agron., 24 (1932), No. 6, pp. 452–459, figs. 2*).—The authors of this contribution from the Iowa Experiment Station found the curves representing the available phosphorus figures as determined by the Truog method (E. S. R., 64, p. 312) to be nearly parallel with those representing the growth of the mycelium of *Aspergillus niger* on culture media containing in suspension the soil to be tested, the mold growth method having been that of Niklas, Poschenrieder, and Trischler.[1]

"It should be noted . . . that the *A. niger* nutrient medium contained 1 per cent citric acid, giving the medium a reaction of pH 4.05. This citric acid was probably mainly responsible for making the phosphorus in the soil available for the growth of the mold. In fact it may be assumed that *A. niger* obtained no more phosphorus from the soil than that which was extracted by the citric acid. Hence, it appears that the amounts of phosphorus soluble in 0.002 N sulfuric acid and in 1 per cent citric acid are relatively similar, and both methods probably indicate the amounts of available phosphorus in the soil."

[1] Ernähr. Pflanze, 26 (1930), No. 5, pp. 97–103, figs. 9.

The determination of lime requirement by the direct addition of calcium carbonate, G. P. Percival (*New Hampshire Sta. Sci. Contrib. 33 (1931), pp. 459–467, pl. 1, figs. 2*).—This contribution has been noted (E. S. R., 66, p. 418).

The determination of sugars in plant extracts, T. G. Phillips (*Jour. Biol. Chem., 95 (1932), No. 2, pp. 735–742; also New Hampshire Sta. Sci. Contrib. 34 (1932), pp. 735–742*).—This contribution from the New Hampshire Station reports upon an investigation into (1) the comparative action of a number of oxidizing reagents on a variety of plant materials; (2) the behavior of these reagents toward sucrose hydrolyzed by invertase; and (3) the relative reliability of methods for the calculation of sucrose hydrolyzed by invertase when determined in the presence of reducing sugars. The four reagents used were the Quisumbing and Thomas form of the Fehling solution, the Shaffer-Hartmann micro reagent, Tompsett's reagent, and a bicarbonate reagent made up as follows: Solution A consisted of 20 g of cupric sulfate crystals made up to 1 l; solution B, of tartaric acid 30 g, anhydrous sodium carbonate 61.2 g, and sodium bicarbonate 50 g. The sodium carbonate and the tartaric acid were dissolved together in hot water, the solution was boiled gently to expel carbon dioxide, the bicarbonate was added and dissolved, and the complete solution was then cooled and diluted to volume (1 l). Trials of the relative accuracy of determinations made with these copper reagents were carried out both with various plant extracts and with invert sugar solutions prepared by acting upon sucrose with an invertase preparation.

"No one of the four oxidizing reagents is best for all the plant extracts used. As far as the materials studied are indicative, it appears that a choice may be made by comparing Fehling's solution and the bicarbonate reagent. Comparison with the Shaffer-Hartmann reagent is suggested, as because of its convenience it is preferred for use with extracts to which it can be applied. As used in this study, Fehling's solution is not reliable for the determination of amounts of glucose less than 5 mg. It may be used to determine as little as 2 mg of sucrose in the presence of 5 mg or more of glucose. The calculations of sucrose determined in the presence of reducing sugars must be made in a manner suited to the peculiarities of the oxidizing reagent used."

Some comparative data on moisture in top and bottom layers of honey after a year of storage, as indicated by the vacuum drying oven and the refractometer, G. E. Marvin and H. F. Wilson (*Jour. Econ. Ent., 25 (1932), No. 3, pp. 514–520*).—The authors point out that in taking samples of honey for moisture determination the samples must be thoroughly mixed, for during the process of crystallization there is shown to be a distinct variation between the amount of moisture in the top and bottom layers and the moisture content of the top layer is always greater than the bottom layer.

Determination of copper in dairy products, H. T. Gebhardt and H. H. Sommer (*Indus. and Engin. Chem., Analyt. Ed., 3 (1931), No. 1, pp. 24–26*).—The authors of this contribution from the Wisconsin Experiment Station shortened the method of Elvehjem and Lindow (E. S. R., 61, p. 612), at the same time improving the separation of the copper sulfide "by shaking out the precipitated copper sulfide with chloroform instead of separating it by filtering."

It was found that the ashing temperature and time used may be the source of large errors in copper determinations. "The ashing temperature should not exceed 505° C. for 3 to 4 hours."

The modified method here detailed gave results agreeing closely with those obtained by the original Elvehjem-Lindow method, "when the latter is used with the necessary precautions as to ashing conditions."

The visual spectrophotometry of dyes, W. C. Holmes, J. T. Scanlan, and A. R. Peterson (*U. S. Dept. Agr., Tech. Bul. 310 (1932), pp. 42, figs. 14*).—Following an introduction to the subject in the form of a brief discussion of color and absorption and the relation of chemical constitution to color, the authors take up the theory and practice of the measurement under consideration in sections on the equipment and technic for visual spectrophotometry; the influence of conditions upon absorption, including the effects of the solvent, the dye concentration, the temperature, the colloidal state, and the H-ion concentration; the identification of dyes (by the spectroscopic method, the spectrophotometric method, and by means of absorption ratios); the spectrophotometric evaluation of dyes (individual dyes, dye mixtures, and spectrophotometric evaluation and practical dye testing); and indicator methods. A bibliography of 58 items is appended.

AGRICULTURAL METEOROLOGY

Meteorology, D. S. Piston (*Philadelphia: P. Blakiston's Son & Co., 1931, pp. VIII+187, figs. 94*).—The author states that "this book has been written primarily as an elementary text on meteorology for college courses," but suggests that it may "also be useful in courses for aviators and for the private study of high school teachers and others who wish to improve their knowledge of the subject." He further states that in choosing material for the book he "has tried to keep in mind the desirability of giving the student an insight into the physical processes and laws underlying the many different phenomena of weather and climate, rather than placing before him a collection of apparently unrelated facts."

It is noted that in the section on climate and vegetation the author concludes that the vegetation of a region is "due to the combined effects of temperature and precipitation," thus apparently ignoring sunlight per se as a contributing factor.

The periodometer: An instrument for finding and evaluating periodicities in long series of observations, C. G. Abbot (*Smithsn. Misc. Collect., 87 (1932), No. 4, pp. 6, pl. 1, fig. 1*).—A mechanical device which greatly reduces the time and labor of computations in the study of periodicities of solar variations is described and its use explained.

Utah snow sampler and scales for measuring water content of snow, G. D. Clyde (*Utah Sta. Circ. 99 (1932), pp. 8, figs. 5*).—This circular describes in somewhat more detail apparatus briefly referred to in articles previously noted (E. S. R., 64, p. 516; 66, p. 117).

Climatological data for the United States by sections, [1931] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 18 (1931), No. 13, pp. [239], pls. 6, figs. 23*).—Summaries are given of climatological data for each month of 1931 and for the year as a whole for each State.

Climatological data for the United States by sections, [January–April, 1932] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 19 (1932), Nos. 1, pp. [203], pls. 2, figs. 9; 2, pp. [202], pls. 3, figs. 2; 3, pp. [208], pls. 2, figs. 4; 4, pp. [204], pls. 2, figs. 5*).—These numbers contain the usual brief summaries and detailed tabular statements of climatological data for each State.

Meteorological observations, [May–June, 1932], C. I. Gunness, K. M. Wheeler, and F. R. Shaw (*Massachusetts Sta. Met. Ser. Buls. 521–522 (1932), pp. 4 each*).—The usual summaries of observations at Amherst, Mass., with brief notes on the more significant features of the weather of each month.

Australia and New Zealand (*Handbuch der Klimatologie*, edited by W. Köppen and R. Geiger. *Band IV, Teil S, Australien und Neuseeland. Berlin:*

Borntraeger Bros., 1932, vol. 4, pt. 8, pp. VII+138, figs. 42).—This number contains two parts, Climatology of Australia, by G. Taylor (pp. 1–108), and The Climate of New Zealand, by E. Kidson (pp. 109–138).

SOILS—FERTILIZERS

[Soil Survey Reports, 1928 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1928, Nos. 20, pp. 34, fig. 1, map 1; 21, pp. 43, fig. 1, map 1*).—The two surveys here noted were made with the cooperation of the Louisiana Experiment Stations and the Wisconsin Geological and Natural History Survey and the University of Wisconsin respectively.

No. 20. *Soil survey of Beauregard Parish, Louisiana*, A. C. Anderson et al.—Beauregard Parish is an area of 750,080 acres in the southwestern part of the State. The southern part of the area is flat and "is drained by streams flowing through shallow valleys lying from about 5 to 10 ft. below the level of the surrounding country." Some of the northern part of the area is better drained.

Caddo very fine sandy loam, a poorly drained upland forest soil, constitutes 20.3 per cent of Beauregard Parish. Bowie very fine sandy loam and Beauregard very fine sandy loam, also soils of deficient underdrainage, follow with 10.1 and 10 per cent, respectively.

No. 21. *Soil survey of Vernon County, Wisconsin*, M. J. Edwards et al.—Situated in southwestern Wisconsin, Vernon County possesses an area of 516,480 acres of lands constituting, for the most part, a well dissected upland of which the general drainage is good.

In order of areal importance, the more extensive soils are Dubuque silt loam, covering 26.8 per cent of the total area, 25.4 per cent of unclassified rough broken land of value principally for forestry, and Clinton silt loam, amounting to 14.8 per cent. In all, 15 types were found and are mapped and described as 12 series.

Soils of Chehalis series and their utilization, W. L. Powers and C. V. Ruzek (*Oregon Sta. Bul. 299 (1932), pp. 19, figs. 10*).—The Chehalis series, occupying nearly 200,000 acres, is described as the most extensive of the recent stream-bottom Willamette Valley lands. This series was found nearly neutral, well provided with such bases as calcium and potassium, but only moderately supplied with nitrogen, so that the inclusion of legumes in the rotation is very important; and its sulfur content was found low enough to make early spring applications of 125 lbs. to the acre of calcium sulfate (as gypsum) a desirable treatment. The use of sulfur without lime was found to increase acidity and to deplete the supply of such exchangeable bases as potassium and calcium. It is considered that supplemental irrigation "is highly desirable for at least a portion of each farm and should increase yields 60 to 100 per cent."

The mineral constituents of the colloidal fraction of soils, J. A. Chucka (*Jour. Amer. Soc. Agron., 24 (1932), No. 6, pp. 421–434, figs. 2*).—Previous work (E. S. R., 64, p. 720) having led the author of this contribution from the Wisconsin Experiment Station to the belief that the base exchange property of the mineral matter of soil colloids is probably due largely to one compound, and that the chemical composition of this compound is $Al_2O_3.4\ SiO_2.XH_2O$, "it seemed reasonable to believe that, besides this compound, mineral soil colloids consist largely of free silica, free alumina, free titanium oxide, free iron oxide, and possibly kaolinite. From a total analysis of soil colloids, an alkali-soluble alumina and silica determination, and a base exchange capacity determination,

it should be possible, by calculation, to formulate a fairly accurate picture of the mineralogical composition of soil colloids."

A sample of soil colloid prepared from Colby silt loam subsoil was subjected to a base exchange capacity determination and to other analyses. From the base exchange capacity determination, it appeared that this soil colloid consisted to the extent of a little more than 50 per cent of the base exchange compound. The proportions of free silica and alumina were "rather small." An excess of combined silica and alumina over that required for the base exchange compound was found. "This excess of these two oxides was not in the ratio found in kaolinite, and since other evidence did not indicate the presence of kaolinite, it was assumed that this combined silica and alumina were probably present in the form of chlorites.... A portion of the iron oxide was probably also present in the chlorites. On the basis of this assumption, 30 to 40 per cent of the soil colloid consisted of chlorites."

Relation of organic matter to organic carbon in the peat soils of New York, B. D. Wilson and E. V. Staker (*Jour. Amer. Soc. Agron., 24 (1932), No. 6, pp. 477–481*).—From the results reported in this contribution from the New York Cornell Experiment Station, "it would seem that 1.724 is as appropriate as any single factor that might be chosen for the purpose of calculating from the percentage of organic carbon the percentage of organic matter in the peat soils of New York. The value 1.736 which is obtained when the factors for the 110 peat soils of the investigation are averaged indicates that the chemical composition of the organic matter of the soils is similar to that of mineral soils."

General soil fertility test, A. T. Wiancko and G. P. Walker (*Indiana Sta. Circ. 191 (1932), pp. 4–8*).—Work reported under this head included a continuation of earlier work (E. S. R., 66, p. 17) of general soil fertility tests and a comparison of various phosphates.

[Soils and soil fertility in North Carolina] (*North Carolina Sta. Agron. Inform. Circs. 67 (1932), pp. [1]+14; 68, pp. [1]+3; 69, pp. [1]+5; 70, pp. [1]+16, fig. 1*).—These circulars deal with the following phases in a more or less popular manner: Nos. 67, Soil Types of North Carolina Found Suited for the Growth of Different Crops, by C. B. Williams, which lists "some of the more or less important types" with the crops to which they are believed to be best adapted; 68, The Part Legumes Play in Maintaining the Productiveness of North Carolina Soils, by Williams, which emphasizes the necessity for plowing under the whole or the greater part of the legume plant "especially so long as the soil is poor or moderately poor in productiveness"; 69, Soil Fertility: A Most Important Factor in Making Richer Farm Homes and Community Life, by Williams, which urges the maintenance of the fertility of cropped soils with adequate supplies of nutrients and organic matter; and 70, The Classification and Identification of North Carolina Soil Types, by W. B. Cobb, which gives nontechnical directions for the identification of soil types, with some indication of the agricultural significance of their differences.

[Soil fertility investigations of the North Dakota Station], H. L. Walster and J. E. Chapman (*North Dakota Sta. Bul. 256 (1932), pp. 7–12, figs. 2*).—Under the head of phosphate investigations are included some results of 14 years' trials of manuring, treatment with superphosphate, and other soil treatments on corn yields; of a 17-year experiment on the use of rock phosphate as a supplement to rotted manure; of work on the comparative effects of various phosphates in applications of equal cost; of trials of the relative effectiveness of manure alone and superphosphate alone on Fargo clay; and of cooperative experiments on several North Dakota farms as to response to superphosphate.

[Soil chemistry and soil survey work] (*Texas Sta. Rpt. 1931, pp. 15, 17, 18, 79–81, 126*).—Note is made of work on chlorosis control, nitrification, sewage sludge, polyhalite, and colloidal rock phosphate, and on a supposed phosphate deposit, all by G. S. Fraps; soil surveys of Collin, Falls, Scurry, and Wheeler Counties; and treatment of "white spots" with various fertilizers, by R. H. Wyche.

[Soil and fertilizer work of the Wisconsin Station] (*Wisconsin Sta. Bul. 421 (1932), pp. 31–41, 90–92, figs. 3*).—The year's progress in the station's work in this field is summarized under the following heads: Deep tillage increases yields but does not pay on Superior red clay soils, manure most valuable when lightly applied on sandy soils, both studied by F. L. Musbach; acid soils lock up phosphates in unavailable forms, by E. Truog; value of lime phosphate on dairy farms, by W. W. Hill; response of Wisconsin soils to potash, by N. J. Volk; lignin largely responsible for acidity and base exchange in peat and marsh soils, by Volk and Truog; summer fallowing depresses corn yields at Marshfield, and methods of applying fertilizer need to be varied, both by Musbach; new information regarding nodule-forming bacteria, by I. L. Baldwin and O. N. Allen; and laboratory studies of nodule-forming bacteria aid in production of efficient cultures for farm use, by A. W. Hofer, E. W. Hopkins, P. W. Wilson, E. R. Hitchner, and D. G. Laird.

Soil respiration, F. B. Smith and P. E. Brown (*Jour. Amer. Soc. Agron., 23 (1931), No. 11, pp. 909–916, fig. 1*).—The authors of this contribution from the Iowa Experiment Station made several attempts to determine the concentration of carbon dioxide in the soil air by means of a soil tube similar to that used by Lundegårdh (E. S. R., 58, p. 18). "This tube is unsatisfactory when used with the Lundegårdh volumetric apparatus, especially on heavy soils, because of the pressure necessary to obtain a sample for analysis. The volumetric apparatus is unsatisfactory when used in the field." The last-named disadvantage was overcome in part by placing the apparatus in a covered wagon.

Further studies on soil respiration, F. B. Smith and P. E. Brown (*Jour. Amer. Soc. Agron., 24 (1932), No. 7, pp. 577–583*).—The authors of this further contribution from the Iowa Experiment Station, comparing the results of volumetric and titrimetric measurements of the rate of respiration in a Carrington loam soil, found "no apparent relation between the determinations by the two methods." The concentration of carbon dioxide in different layers of the soil under a Lundegårdh respiration bell indicated that diffusion might be downward, and that this downward diffusion, together with the solution of carbon dioxide and its removal in drainage water, influenced the rate of respiration. Comparing the average rate of production of carbon dioxide by soil from various depths and the total production for the profile with the rate of respiration, the authors found that the greatest production occurred in the surface and that adsorption took place in the subsurface soils. The total production appeared much greater than the rate of respiration even when allowance was made for the adsorption by the subsurface soil.

"These results confirm the conclusion that soil respiration is not a simple diffusion of carbon dioxide through the soil and can not be regarded as an accurate measure of the rate of carbon dioxide production in the soil."

Organic matter as a factor in classification of the soils of dry regions, C. F. Shaw (*Jour. Amer. Soc. Agron., 24 (1932), No. 7, pp. 565–577, fig. 1*).—From determinations of organic matter content and color, from observations of climatic influences, and from other data regarding the soils of seven areas widely distributed over the State, the author of this contribution from the

University of California concludes that the organic matter content can not be considered the dominant factor in determining the color of the soils in regions of periodic precipitation with hot dry summers and cool moist winters, and that it occupies a very minor place in determining the characteristics of soil profiles. He finds that of much more importance in profile development, and consequently in soil classification, are the mineral composition of the parent material, the degree of oxidation of the metallic compounds, especially those of iron, the rate and duration of leaching, and the extent of the downward migration and subsoil accumulation of colloidal clays and cementing materials.

Activity of nitrification processes in the fall and winter months, R. P. Bartholomew (*Jour. Amer. Soc. Agron., 24 (1932), No. 6, pp. 435–442*).—Nitrification occurred during the fall and winter months, according to the observations of the author of this contribution from the Arkansas Experiment Station, but nitrates disappeared in relatively large quantities from soils not planted to cover crops. Cover crops were found of value as a means of preventing these losses of soluble nitrogen compounds.

The periodism of nitrogen fixation in soils and the influence of inoculation with Azotobacter, L. G. Thompson, Jr. (*Jour. Amer. Soc. Agron., 24 (1932), No. 6, pp. 442–451, fig. 1*).—Inoculating sterile soils with *A. chroococcum*, the author of this contribution from the Iowa Experiment Station observed a gain in total nitrogen followed by a slight decrease, which, in turn, was followed by a further gain. These and other experiments led to the conclusion that there is in uncropped soils a cycle of nitrogen fixation and denitrification.

An inoculation of the soil with *A. chroococcum* caused a considerable reduction in the nitrate content of the soil. The soils which were lowest in nitrate nitrogen generally made the largest gains in total nitrogen. In general, the soils which were lowest in nitrate nitrogen contained the smallest numbers of Azotobacter. Azotobacter appeared to prefer fixed nitrogen to free nitrogen, but used free nitrogen when there was a deficiency of fixed nitrogen.

The nitrogen content of uncropped soils could be increased by inoculation with Azotobacter and by the addition of some suitable carbohydrate to the soil.

The effect of ammonium sulfate on soil reaction, J. W. White (*Jour. Amer. Soc. Agron., 23 (1931), No. 11, pp. 871–877*).—Under the conditions of the Pennsylvania field plat experiment the author of this contribution from the Pennsylvania Experiment Station found ammonium sulfate to increase soil acidity in proportion to the equivalent of 1 molecule of dibasic acid for each molecule of ammonium sulfate applied. The theoretical lime requirement based on this reaction was compared with the average actual lime requirement of 3 plats. "The average difference between the theoretical lime requirement (pounds of ammonium sulfate multiplied by 0.757) and that actually found represents less than 1 c c of N/28 limewater or 1 c c of N/50 sodium hydroxide in terms of the author's method."

The comparative effects of concentrated nitrogenous fertilizers on permanent soil acidity, F. E. Allison (*Jour. Amer. Soc. Agron., 23 (1931), No. 11, pp. 878–908*).—This paper, a contribution from the U. S. D. A. Bureau of Chemistry and Soils, presents "a theoretical discussion of the comparative effects of the addition of different concentrated nitrogenous fertilizers on permanent soil acidity," dealing chiefly with ammonia salts and nitrates. Suggestions are also given regarding the best methods of conducting experiments designed to show quantitatively the effect of fertilizers on soil acidity.

The influence of lime and phosphate fertilizers on soil reaction, F. B. Smith, P. E. Brown, J. B. Peterson, and F. E. Schlots (*Jour. Amer. Soc.

Agron., *24* (*1932*), *No. 6*, *pp. 469–478*).—Report is made from the Iowa Experiment Station of greenhouse experiments on Tama silt loam, of which the reaction was not appreciably affected either by superphosphate or by fine rock phosphate during 25 weeks, although limestone at the rate of three tons to the acre raised the pH value from 5.46 to 6.50; and on a field experiment with Carrington loam under a 5-year rotation, in which last-named trial both the rock phosphate and the superphosphate showed a tendency to decrease the acidity, though only "to an insignificant degree." Another field experiment on the same type showed no apparent effect of either form of phosphate. In the greenhouse the same soil type tended to increase in acidity under superphosphate treatment and to decrease under the influence of rock phosphate, but the effect was in neither case very marked.

Commercial fertilizers, H. R. Kraybill et al. (*Indiana Sta. Circ. 190* (*1932*), *pp. 17*, *fig. 1*).—This report on the annual inspection of fertilizers discusses the findings of the year, but omits the usual tabulations of analyses of individual samples.

AGRICULTURAL BOTANY

Electric light in studies and in applications of botany [trans. title], L. Pigorini (*Ann. R. Staz. Bacol. Sper. Padova*, *46* (*1931*), *pp. 530–540*, *figs. 5*).—Striking contrasts in the growth of plants are ascribed to the influence of additions to the available illumination.

Tests of the use of electric light in the cultivation of plants [trans. title], F. Campionaria (*Ann. R. Staz. Bacol. Sper. Padova*, *46* (*1931*), *pp. 514–522*, *figs. 5*).—Results are detailed and illustrated of the effects of the use of electric light, with and without the additional use of sunlight, on the growth of young plants. The addition of electric light to daylight gave a substantial increment of growth.

The feeding power of plants, W. Thomas (*Plant Physiol.*, *5* (*1930*), *No. 4*, *pp. 443–489*).—The several main sections of this publication, reporting a study at the Pennsylvania Experiment Station, deal with an introductory account; the chemical nature of the root exudations; the influence of the degree of the acidity of the cell sap; theories proposed to explain differences in the feeding power of plants; and the influence of other factors, as permeability, ion antagonism, Gibbs-Donnan distribution law, and the effect of differences in potential between soil and plant. The literature cited includes 214 titles.

The life of the plant cell.—[II], Inclosures of living matter, R. Combes (*La Vie de la Cellule Végétale. Les Enclaves de la Matière Vivante. Paris: Armand Colin*, *1929*, *vol. 2*, *pp. 220*, *figs. 13*).—This booklet, volume 2 of the work previously noted (E. S. R., 60, p. 423), deals chiefly with the inclosures of living, of liquid, and of fatty material in the cells.

Studies on limiting factors in carbon dioxide assimilation, T. H. van den Honert (*K. Akad. Wetensch. Amsterdam, Proc.*, *32* (*1929*), *No. 7*, *pp. 1008–1021*, *figs. 3*).—"The velocity with which a green plant assimilates CO_2 depends upon three environmental factors, to wit: CO_2 concentration, light intensity, and temperature." F. F. Blackman is credited with an early formulation[a] of this relation, one expression of which has been noted (E. S. R., 17, p. 234), to the effect that a process conditioned as to its rapidity by several separate factors is limited as to its rate by the pace of the slowest factor.

Carrying out his experimentation with a filamentous alga, *Hormidium* sp., in such a way that access of both carbon dioxide and light to all plastids would

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[a] Ann. Bot. [London], 19 (1905), No. 74, pp. 281–295.

be about equalized, the author concluded that it is possible to study the three parts or phases of the assimilatory mechanism separately without interfering with the organization of the cell, by altering the environmental factors only. He then determined the so-called assimilation number of the Hormidium, determining the chlorophyll content of the algae spectrophotometrically and taking as an average of 5 determinations the number 6.75 at 20° C. and a light intensity of 6.18. The unit of cell material contained on an average 0.0271 mg of chlorophyll.

Effect of fertility on the carbohydrate-nitrogen relation in the soybean, F. A. Welton and V. H. Morris (*Plant Physiol.*, *5* (*1930*), *No. 4*, *pp. 607–612*, *figs. 3*).—It was intended at the Ohio Experiment Station to ascertain whether hypernutrition, particularly as to nitrates, affects the carbohydrate-nitrogen relation in the legume soybean as it does in such plants as oats, wheat, and tomatoes.

It was found that those soybeans which were grown in sand and Wooster silt loam (3 : 1) contained more dry matter and more total carbohydrate than did those grown either in soil (Wooster silt loam) or in manure and Wooster silt loam (3 : 1). In general, the increase was due chiefly to easily hydrolyzable carbohydrates, cellulose, and lignin. The increase of carbohydrates in the sand-grown plants was not accompanied by a similar decrease in nitrogen, as has been found to be the case in certain nonlegumes. The high nitrogen content of these plants, however, was associated with the development of relatively large numbers of nodules on the roots of the plants. The stems of the sand-grown plants were comparatively tough and rigid and not inclined to lodge.

Photosynthesis in the presence of alkaloids [trans. title], G. Dragone-Testi (*Ann. Bot.* [*Rome*], *19* (*1931*), *No. 2*, *pp. 202–216*).—Tabulations, with discussion, are given of the effects corresponding to graduated strengths in solutions of morphine, caffeine, cocaine, and strychnine on the phenomenon of photosynthesis in *Potamogeton crispa*.

Action of alkaloids on seed germination [trans. title], G. Dragone-Testi (*Ann. Bot.* [*Rome*], *19* (*1931*), *No. 2*, *pp. 345–352*).—Having recorded in the account above noted the effects following excitation of plants with certain alkaloids, the author herein confirms the effects of alkaloidal action.

Germinative capacity in embryos removed from seeds [trans. title], M. Juliani (*Ann. Bot.* [*Rome*], *19* (*1931*), *No. 2*, *pp. 353–364*).—The author has tested the germinative capacity of embryos removed from seed, either mature or immature, and with or without albumen, from divergent families of dicotyledons and monocotyledons. Practically all were found in condition to germinate if taken when in opportune condition into Knop's solution with the addition of agar.

Seed stimulation through increase or decrease of pressure [trans. title], S. Konsuloff (*Biol. Gen.*, *5* (*1929*), *No. 4*, *pp. 605–626*, *fig. 1*).—Cell stimulation, here taken to mean alteration of the tempo (produced by external influence) in the life processes which persists after the cessation of the influence and becomes observable in succeeding generations but without affecting the genotype, is said to be primarily causal in the case of both positive and negative pressures in the rice seed. Studies with carbon dioxide under pressure gave in certain conditions safely positive results, militating against the assumption that carbon dioxide narcosis is responsible. The results with dry or with soaked seed opposed the view of a direct influence on the enzymatic processes. It is said that the elevation or lowering of enzymatic processes showed as the result,

not the cause, of cell stimulation, which has to do with the cell mechanism, the condition of the protoplasm itself. The alterations persist through several generations, without change of genotype.

The existence of cell stimulation in the sense above indicated was confirmed by experimentation on the "*dauermodifikationen*" of unicellular living beings.

Uptake of nutritive material by plants [trans. title], E. Haselhoff, F. Haun, and W. Elbert (*Landw. Vers. Sta., 111 (1930), No. 1–2, pp. 11–62*).—This work, the conduct, features, and results of which are presented in detail, with tabulations, made use of rye, oats, winter wheat, peas, and potatoes.

Influence of the nitrate-ion-concentration of nutrient solutions on the growth of summer wheat, M. A. J. Goedewaagen (*K. Akad. Wetensch. Amsterdam, Proc., 32 (1929), No. 2, pp. 135–150, figs. 5*).—"The nitrate nitrogen concentrations which render good or at least satisfactory growth possible cover a broad range, the limits of which were found at an amount of N of about 2 and about 200 p. p. m. of nutrient solution in the experimental conditions described."

On a substance causing root formation, F. W. Went (*K. Akad. Wetensch. Amsterdam, Proc., 32 (1929), No. 1, pp. 35–39, pl. 1*).—A special nonspecific heat-resisting substance (hormone?) is stated to be extractable from barley leaves and germinating seed which is capable of starting the development of new roots. It is formed in leaves and sprouting buds. Apparently it is transferred by the phloem. It occurs in considerable quantities in the branches, from which it is removed within a week when attached. It does not disappear from cut branches, the basal parts of which are thus indicators of its presence.

Influence of leafage removal on anatomical structure of roots of Stipa pulchra and Bromus hordeaceus, K. W. Parker and A. W. Sampson (*Plant Physiol., 5 (1930), No. 4, pp. 543–553, figs. 4*).—Water cultures as used in this work at the California Experiment Station have serviceably indicated root behavior and anatomical differences. Frequent removal of the aerial growth gave poorly developed root structure. Further deficiencies are indicated.

"This experiment supports the more general observations of similar leafage removal studies with many species during the period of active growth under field conditions. Where it is important to maintain the herbaceous cover, as for pasturage, or where an elaborate, robust root system is necessary to bind the soil in order to control erosion, frequent leafage removal should be avoided."

Variations of chlorophyll in the mulberry leaf [trans. title], D. Ongaro (*Ann. R. Staz. Bacol. Sper. Padova, 46 (1931), pp. 549–555*).—In this note, regarded as preliminary, the author reports wide differences in the chlorophyll produced and retained by the leaves. Obscuration of the leaves first increased then decreased the chlorophyll percentage.

Purine compounds produced by rotting in plant organisms [trans. title], S. Tonzig (*Ann. Bot. [Rome], 19 (1931), No. 2, pp. 217–248*).—The author has determined both qualitatively and quantitatively in plants the presence of purine compounds not combined in the form of nucleic acid. The proportion, with respect to total nitrogen, increases with the activity and with the increase of the organ and offers a clear indication of degradation products.

Bacteria producing trimethylene glycol, C. H. Werkman and G. F. Gillen (*Jour. Bact., 23 (1932), No. 2, pp. 167–182*).—The authors of this contribution from the Iowa State College obtained 15 cultures of bacteria capable of producing trimethylene glycol from glycerol, all of the cultures belonging to the group of the citrate-positive, coli-aerogenes intermediates.

"It is proposed to recognize the group as diagnosed as a new genus in the family Bacteriaceae. The name Citrobacter is proposed for the genus. Seven

species are recognized in the genus; *C. freundii* (Braak), comb. nov. is the type species. Should the genus Bacterium be retained, Citrobacter becomes the name of a subgenus."

Two rapid methods for distinguishing between Escherichia coli and Aerobacter aerogenes, G. A. LINDSEY and C. M. MECKLER (*Jour. Bact., 23 (1932), No. 2, pp. 115–121, fig. 1*).—The Werkman modification, involving the use of ferric chloride to shorten the Voges-Proskauer test, was successfully applied by the authors of this contribution from the North Dakota Experiment Station to 24-hour cultures in ordinary glucose broth, with a saving of three days' time and the avoidance of a complicated, specially prepared medium.

Report is made of a methylene blue reduction test for distinguishing between *E. coli* and *A. aerogenes*, by means of which results agreeing with those of the Voges-Proskauer test in 44 out of 45 cases were obtained. This test required but 1 hour and did not demand a special culture medium.

Potentiometric measurements of oxidation reduction potentials paralleled the dye reduction observations.

Effect of molds on temperature of stored grain, J. C. GILMAN and D. H. BARRON (*Plant Physiol., 5 (1930), No. 4, pp. 565–573, figs. 2*).—"The data gathered [at the Iowa Experiment Station] showed that under the conditions of the trials, the rises in temperature due to germination of oats, wheat, and barley, were 6.8, 2.6, and 3.6° C., respectively. *Aspergillus flavus* raised the temperatures of oats, wheat, and barley at 18 per cent moisture content, 26, 7.4, and 16°, respectively. *A. niger* raised the temperatures of these grains 26.3, 9.8, and 21.9°, respectively. *A. fumigatus* raised the temperature of oats at 18 per cent moisture, 26.4 and wheat 5.2°. At 20 per cent moisture content, *A. flavus* and *A. niger* raised the temperature of wheat 15.8 and 23.4°, respectively. These facts strongly suggest the probability that in bins of stored grains marked increase in temperature may be ascribed to mold growth."

GENETICS

Interspecific and intergeneric hybridization in relation to plant-breeding (*Cambridge, Eng.: Imp. Bur. Plant Genetics, 1932, pp. [2]+30*).—This general survey of the literature on the subject cites 137 titles.

Morphological and genetical studies of fatuoid and other aberrant grain-types in Avena, E. T. JONES (*Jour. Genetics, 23 (1930), No. 1, pp. 1–68, pls. 2*).—Of nine fatuoids found in commercial varieties of oats, those in Fulghum, Orion, Ceirch-du-bach, Scotch Potato, and Royne possessed long basal pubescence, while those in Cornellian, Golden Giant, and Record had distinctly short pubescence. The breeding behavior of the heterozygotes and the general vigor of the fatuoid intermediate and normal segregates indicated that these varietal forms may belong to the A series group of Huskins' classification. A fatuoid in Golden Rain (E. S. R., 57, p. 123) differed from the normal strain in spikelet number as well as in type of grain. The extracted segregates in this form showed definite association between fatuoid grain and low spikelet number. Fatuoids which appeared in the F_3 and F_4 generations of crosses between *A. sterilis culta* and *A. sativa* and between *A. sativa* and *A. nuda* agreed in general external characteristics with fatuoids of the A series type. A peculiar subfatuoid mutant from an F_4 family of Red Algerian × Golden Rain bred true to its characteristic type of partially disarticulating florets and freely shedding spikelets. True-breeding strongly awned and other types differing variously from typical fatuoids were found in Ceirch-du-bach and Norwegian Grey oats and in the progenies of Victory × Red Algerian and Red Algerian × Scotch Potato.

A study of crosses between fatuoids and normal strains of several varieties and certain strongly awned types, and between fatuoids of *A. sativa* and *A. sterilis culta*, pointed to simple allelomorphic relationships between the several abnormal forms. The three main hypotheses of the origin of the A series fatuoids are discussed with reference to fatuoids, subfatuoids, and the various strongly awned types, and a number of theoretical and practical limitations are pointed out. Genetical differences between the respective "normal" chromosomes of *A. sativa* and *A. sterilis culta* are demonstrated and discussed, and separate formulas are given for the somewhat parallel series of mutations that were found to occur within these two species. A modified mutation hypothesis of general application to fatuoids as well as to the various subfatuoid and true-breeding "awned" types is submitted in place of the chromosome aberration hypothesis.

A study of crosses between Trebi and three smooth-awned varieties of barley, P. A. DAVID (*Iowa State Col. Jour. Sci., 5 (1931), No. 4, pp. 285–314, figs. 2*).—The inheritance of roughness of awns, time of flowering, plant height, number of culms, spike length, and plant yield was studied at Iowa State College in crosses between the rough-awned Trebi as the male parent and Comfort, Glabron, and Velvet.

Rough awns seemed dominant to smooth awns—a hypothesis presented assumed a dominant factor for smoothness of awns with a dominant inhibitor. Earliness apeared dominant to lateness with two important complementary factors involved. There was little evidence of the inheritance of number of culms or for yield differences. In four out of five crosses the variability of F_2 and F_3 hybrid generations indicated the segregation of genetic factors for length of spike. In the other cross the two parents did not differ in length of spike. Correlations were also calculated between plant yield and other quantitative characters in the F_2 generation.

Inheritance of white sheath in maize, F. H. CLARK (*Jour. Heredity, 23 (1932), No. 6, pp. 235–237, fig. 1*).—White sheath, a chlorophyll abnormality of corn studied at the Michigan Experiment Station, was shown to depend on the presence of two complementary unlinked recessive factors (ws_1 ws_1, ws_2 ws_2) for its expression, and because of the great variation in its intensity, additional modifying factors seemed to be involved. Crosses between this white sheath and that of Kempton (E. S. R., 47, p. 326) proved that the latter type also carries ws_1 and ws_2. According to linkage studies, white sheath is not linked closely with sun-red, white-cap, shrunken, aleurone-*R*, or liguleless leaf. The crossover percentage with shrunken endosperm of 46.86±4.62 suggested a loose linkage.

Inheritance of dwarfing in wheat, D. C. TINGEY (*Utah Acad. Sci. Proc., 8 (1930–1931), pp. 59, 60; abs. in Utah Sta. Circ. 100 (1932), p. 6*).—The F_2 and F_3 of tall × tall varieties of wheat and of tall × dwarf forms, studied at the Utah Experiment Station, gave evidence of the existence of at least three genetic classes of tall types. Assuming two main factor differences with *D*, a dominant dwarfing factor, and *I*, an inhibiting factor, the classes are *DDII* (Hard Federation, Federation, and Sevier), *ddii* (Dicklow), and *ddII* (Hope, Preston, and Goldcoin).

Cytologic and genetic studies of variability of strains of wheat derived from interspecific crosses, L. POWERS (*Jour. Agr. Research [U. S.], 44 (1932), No. 11, pp. 797–831, pls. 5, fig. 1*).—In cytological studies made at the Minnesota Experiment Station on 32 plants of Marquillo (Marquis common × Iumillo durum), 27 of Marquis, and 30 of Minnesota 2303 [(Marquis × Iumillo) × (Kanred × Marquis)] wheat, 2 plants of Marquillo had 41 somatic chromosomes, whereas all others had the normal number, 42.

Micronuclei were observed in 2.8 per cent of the miscrospores of Marquillo and in 0.8 per cent of each of the other varieties. Extrusion of karyotin was found in 2.8 per cent of the very young microsporocytes of a culture of Marquillo. Nonorientation of bivalents (the occurrence of one or more bivalents off the equatorial plane just before disjunction of the main group of bivalents during metaphase of sporogenesis) took place in 10.8 per cent of the cells of the young microsporocytes of Marquillo and in 6.9 per cent in Marquis. Nonconjunction (the occurrence of one or more univalent chromosomes during metaphase of the reductional division, when presumably their homologous mates are present) was exhibited in 6.1 per cent of the Marquillo microsporocytes and in 7.7 per cent of Marquis. Polyvalence (the union of 3 or more chromosomes during metaphase of the reductional division) was shown by an average of 1.4 per cent of the cells examined in Marquillo and 0.4 per cent in Marquis. The microsporocytes of Marquillo showed 6.3 per cent and of Marquis 2.8 per cent of predisjunction (the disjunction of one or more bivalents in advance of the main group of conjugated chromosomes during metaphase of the reductional division). Microsporocytes showing fragments of chromosomes were found in both Marquillo and Marquis.

Cytological studies made on 3 cultures of Marquillo, showing, respectively, (1) high, (2) low percentage of chromosomal aberrations, and (3) 41 somatic chromosomes are also described.

Coefficients of correlation between percentage frequencies of different aberrations indicated that micronuclei are associated with both nonorientation of bivalents and nonconjunction, whereas the two latter phenomena are not correlated. Statistical studies on progenies of Marquillo demonstrated a positive relationship between cytologic aberrations and the coefficients of variability of weight of seed, type of plants, and fruitfulness. Micronuclei and nonconjunction are more highly correlated with the coefficients of variability of weight of seed per plant than nonorientation, and micronuclei and nonorientation are more highly correlated with the coefficients for height of plants and fruitfulness than is nonconjunction. Micronuclei, nonorientation, and nonconjunction seemed to be associated negatively with average weight of seed per plant, average height of plants, and percentage of fruitfulness; and probably nonconjunction alone is negatively associated with percentage emergence and percentage matured.

Marquillo was found to possess greater germinal instability than Marquis. The germinal instability of Marquillo was found to be associated with the greater variability of its agronomic characters and seemed responsible for the high percentage (7.2) of natural crossing found in this variety. The fact that Minnesota 2303 equalled Marquis in germinal stability is held to prove that the desirable durum and vulgare qualities could be combined into a single germinally stable wheat variety.

Partly fertile hybrids of common wheat with Khapli emmer, L. Hollingshead (*Jour. Heredity, 23 (1932), No. 6, pp. 247–253, figs. 4*).—The partly fertile normally developed hybrids of H-44-24 wheat ♂ (derived from Marquis × Yaroslav emmer) with Khapli emmer ♀, obtained at the Dominion Rust Research Laboratory at Winnipeg, appeared unfitted to withstand unfavorable weather conditions. Cytologically they were more irregular than other pentaploid wheat hybrids described previously, having more than 7 unpaired chromosomes in a portion of the pollen mother cells.

***Genetic and cytological investigations on Asparagus officinalis L.*, W. S. Flory, Jr.** (*Genetics, 17 (1932), No. 4, pp. 432–467, figs. 56*).—Working chiefly with the Mary Washington variety, the author in this study at the University

of Virginia observed 20 diploid chromosomes. Six members of the 10 pairs were larger than the other 4, and, although the various chromosomes evinced individual peculiarities in both haploid and diploid conditions, there were no apparent differences between the two members of any pair. The megaspore mother cell developed into two uninucleate and one binucleate megaspores. One of the uninucleate megaspores developed into an 8 nucleated embryo sac, and the other two degenerated. The author believes that sex determination in asparagus may be explained with the aid of Correns' formula on a genic basis which considers all the factors, internal or external, that may influence sex expression.

Growth and inheritance of leaf dimensions in the broad-bean, M. J. SIRKS (*K. Akad. Wetensch. Amsterdam, Proc., 32 (1929), No. 8, pp. 1066–1084, figs. 4*).—"The above data and conclusions clearly show that the problems of quantitative inheritance are not yet solved.... On the contrary, in my opinion, the problems of quantitative inheritance have become of vital interest in genetics; they have been neglected too long, and their study is quite essential for obtaining real notions on the nature of genes."

Bud variation in apples, A. D. SHAMEL and C. S. POMEROY (*Jour. Heredity, 23 (1932), Nos. 4, pp. 173–180, figs. 2; 5, pp. 213–221, figs. 2*).—A general discussion of the nature and occurrence of fruit variation in the apple, in which are tabulated the varieties known to have mutated, together with a number of such mutations. The origin of some of the better known variants, such as Starking, Richared, Staymared, and Blackjon, are recounted.

[Inheritance studies with sheep and goats], B. L. WARWICK, J. M. JONES, W. H. DAMERON, and P. B. DUNKLE (*Texas Sta. Rpt. 1931, pp. 23, 24, 25*).—An account is given of the inheritance of the polled and horned character of Rambouillet sheep and of ridgeling characteristics and type in goats.

FIELD CROPS

Experiments with permanent pastures, A. B. BEAUMONT (*Massachusetts Sta. Bul. 281 (1932), pp. 36, figs. 11*).—In an experiment carried on from 1909 to 1916 on an alluvial fine sandy loam not typical of much of the permanent pasture land of Massachusetts, applications of basic slag and low-grade potassium sulfate changed pasture flora consisting largely of bluets (*Houstonia coerulea*) and poor grasses to one composed largely of white clover and good grasses.

In three other studies carried on from 1921 to 1930 on an upland glacial till soil characteristic of much of the dairying section of the State, pasture flora consisting mainly of running cinquefoil (*Potentilla canadensis*), or mainly of haircap moss (*Polytrichum commune*), or of smaller proportions of these with some grasses and clovers were transformed to flora consisting principally of white clover, bentgrasses, and Kentucky bluegrass. Excepting a toxic effect of sodium nitrate for haircap moss (E. S. R., 67, p. 35), lime was the single material most effective in producing desirable changes in vegetation. Although lime and potash made the most effective two-material combination, lime with potash and phosphate resulted in the greatest change in vegetation. Nitrogen returned the greatest relative and absolute increases in yield, being more effective when used with minerals. White clover was maintained in the presence of nitrogen better with an abundance of minerals than with a poor supply. Potash generally encouraged the presence of white clover, thereby raising the protein content of the herbage. On areas with a vegetation largely of grass, application of nitrogen usually caused an increase in dry matter and a relatively larger yield of protein than of dry matter, but had little or no effect on areas with a high percentage of clover.

Fertilized plats were grazed more closely than unfertilized areas, particularly where lime in addition to fertilizer was applied. Chemical analyses of clippings showed that application of calcium, nitrogen, and phosphorus resulted in an increase of these elements in the herbage, suggesting that the composition of the herbage as affected by fertilizers may be an important factor affecting palatability. Botanical analyses of several of the crops demonstrated the importance of such analyses in the interpretation of results. Seeding of Kentucky bluegrass and white clover seed hastened the appearance of white clover in the one experiment in which it was tried, although apparently the ultimate results will be the same whether or not white clover is sown. In some pastures, the appearance of white clover might be hastened one or two years by seeding. The conclusion was that the best results from the top-dressing of upland pastures in Massachusetts may be expected from lime supplemented with phosphate, potash, and nitrogen.

Relation of hydrogen-ion concentration of soils to the growth of certain pasture plants, H. P. Cooper (*Plant Physiol., 7 (1932), No. 3, pp. 527–532*).—During a study of the ecological conditions influencing various plant associations found in 546 New York pastures, a more or less definite succession of pasture plant associations was observed to accompany depletion of pasture soils. Kentucky bluegrass requires a fertile soil, and it is likely to dominate on good soils. As the soil is depleted bentgrasses or redtop encroach on bluegrass and may dominate. On further depletion of the soil sweet vernal grass may dominate, and finally poverty grass, weeds, and trees represent the dominant type of vegetation. A close relationship was not found between the soil reaction and the dominance of the various pasture grasses. The modal class for Kentucky bluegrass, bentgrass, and sweet vernal and poverty grasses was the same, ranging from pH 5 to 5.50. Evidently some major soil condition other than acidity determines the succession of pasture plants accompanying the depletion of certain soils. Creeping bentgrass was not found on soil with high H-ion concentration, suggesting that it is less tolerant than some other bentgrasses to nutritional complexes characteristic of certain acid soils. The pH values of soils collected from under some of the common plants encroaching upon depleted pastures are also shown.

Legume inoculation, P. H. Kime (*North Carolina Sta. Agron. Inform. Circ. 66 (1932), pp. [1]+4*).—Methods for and advantages of inoculating legumes are described briefly, with lists of the cultivated plants belonging to the seven inoculation groups.

The relations between crop yields and precipitation in the Great Plains area.—Sup. 1, Crop rotations and tillage methods, E. C. Chilcott (*U. S. Dept. Agr., Misc. Circ. 81, Sup. 1 (1931), pp. 164, figs. 11*).—Supplementing the material recorded earlier (E. S. R., 56, p. 730), this publication presents detailed analyses of the results obtained in crop rotations and with different tillage methods during extended periods at the northern group of 16 field stations, and the detailed crop yields at 23 field stations in the Great Plains area. Discussion of seed bed preparation, cropping systems, and farm organization is based on comparison of results at the 16 northern stations. Comments and suggestions are made in regard to crop rotations and tillage methods in the area; and the farm home and the labor problem, marginal production, and insurance against total crop failure are treated briefly.

Varietal experiments with red clover and alfalfa, and field tests with meadow mixtures, R. J. Garber and T. E. Odland (*West Virginia Sta. Bul. 250 (1932), pp. 16, figs. 2*).—Red clover strains from Ohio, Wisconsin, Michigan, Tennessee, Idaho, and Oregon led in that order in average hay yields. More

than 2 tons per acre for 2 cuttings were produced by all of these except the Oregon strain, which, however, averaged 0.5 ton more than the best foreign clover.

Comparison of alfalfa varieties in cooperation with the U. S. Department of Agriculture showed Lebeau, Disco No. 28, Grimm, Canadian Variegated, Cossack, Hardigan, and certain strains of common alfalfa to give satisfactory yields. If common alfalfa is to be sown in West Virginia, an adapted strain is advised.

Meadow mixtures containing tall oat grass yielded highest. The leading mixture, tall oat grass, timothy, and alsike with a yield of 2.96 tons per acre, averaged about 0.33 ton more hay than tall oat grass, the most productive pure culture. Timothy and alfalfa also were very satisfactory in increasing yields in the several mixtures including them, while orchard grass was least desirable in this respect.

Nitrogenous fertilizers on small grains following sorghums, J. P. CONRAD (*Jour. Amer. Soc. Agron., 24 (1932), No. 4, pp. 316–322*).—Further experiments at the California Experiment Station, considered together with previous work (E. S. R., 60, p. 434), showed that for the experimental conditions small grains following sorghums are benefited by applications of nitrogenous fertilizers and, as measured by yield increases, roughly proportional to the quantity of fertilizer applied. Several hypotheses advanced to explain the depressing effect of sorghum on the yield of the following crops are discussed briefly.

[Field crops experiments at the Moses Fell Annex Farm, Bedford, Ind.], H. J. REED and H. G. HALL (*Indiana Sta. Circ. 191 (1932), pp. 9, 10, 18, 19*).—The response of pasture to fertilizers, manure, and lime and of tobacco to fertilizers is again (E. S. R., 66, p. 27) reported on briefly. The average acre yields of varieties of winter wheat, rye, and barley, oats, soybeans for hay, and of spring barley, wheat, and rye are tabulated for various periods.

[Field crops investigations in North Dakota, 1929–1931], T. E. STOA, L. R. WALDRON, G. N. GEISZLER, H. C. HANSON, C. E. MANGELS, T. H. HOPPER, A. F. YEAGER, L. MOOMAW, R. W. SMITH, O. A. THOMPSON, C. H. PLATH, V. STURLAUGSON, and E. G. SCHOLLANDER (*North Dakota Sta. Bul. 256 (1932), pp. 12–17, 24–26, 29–31, 44, 54–57, 58, 59, 60, 61, 62, figs. 5*).—Report is made of the further progress (E. S. R., 63, pp. 820, 822, 823) of agronomic experiments at the station and substations, including breeding work with wheat, corn, and potatoes; variety tests with corn, wheat, oats, barley, flax, alfalfa, sweetclover, field peas, millet, and miscellaneous forage grasses; cultural (including planting) trials with corn and alfalfa; studies of the resistance of wheat to late spring frost and to drought and of loss of stands in alfalfa; experiments on the effect of moisture and freezing on the vitality of seed corn; surveys of protein content, weight per bushel, and smut susceptibility of wheat; determination of the oil contents of seed of flax varieties and of safflower, the phosphoric acid content of alfalfa hay, and the composition of sweetclover screenings; control studies with quack grass (E. S. R., 65, p. 39), leafy spurge, bindweed, wild oats, French weed, mustard, and peppergrass; tillage and crop rotation experiments; and pasture and range improvement investigations. Certain lines of work were in cooperation with the U. S. Department of Agriculture.

[Field crops investigations in Texas], P. C. MANGELSDORF, E. B. REYNOLDS, D. T. KILLOUGH, R. E. KARPER, G. T. MCNESS, R. H. WYCHE, R. E. DICKSON, D. SCOATES, B. C. LANGLEY, B. L. WARWICK, H. E. REA, W. R. HORLACHER, E. MORTENSEN, R. A. HALL, P. R. JOHNSON, B. H. STANSEL, H. DUNLAVY, P. B. DUNKLE, I. M. ATKINS, D. L. JONES, F. GAINES, J. J. BAYLES, H. F. MORRIS, J. R. QUINBY, J. C. STEPHENS, W. H. FRIEND, J. F. WOOD, C. H. MCDOWELL, and

L. E. BROOKS (*Texas Sta. Rpt. 1931, pp. 40–59, 103–106, 109–111, 116, 117, 118, 119–121, 124–126, 127–129, 130, 131, 134–138, 139, 140, 142–144, 146, 147, 148, 149, 151–155, 165, 166, 169, 170, 175, 176, 181, 182*).—Continued agronomic and plant breeding experiments (E. S. R., 66, pp. 22, 27, 29) reported on from the station and substations embraced variety tests with corn, wheat, oats, barley, rice, grain sorghum, sorgo, broomcorn, cotton, sugar beets, potatoes, peanuts, soybeans, cowpeas, alfalfa, lespedeza, and miscellaneous legumes and grasses; trials of tobacco and *Nicotiana rustica*; breeding work with wheat, oats, barley, corn, sweet corn, rice, grain sorghum, sorgo, cotton, and peanuts; inheritance studies with corn, grain sorghum, and cotton; a cytological study with grain sorghums; a study of the genetic and cytological relationships of corn, *Euchlaena*, and *Tripsacum*; effect of irradiation on cotton, and asexual propagation of cotton; cultural (including planting) trials with corn, wheat, rice, grain sorghum, sorgo, cotton, and hulled v. unhulled sweetclover; seed bed preparation studies; comparisons of corn and grain sorghums; study of tillering in milo and Sudan grass; seed treatments with sorghums; fertilizer trials with crops in rotation, corn, wheat, oats, rice, alfalfa, and cotton; harvesting, storage, and ginning experiments with cotton; weed control tests; pasture improvement and management investigations; soil fertility studies; study of run-off water losses in relation to crop production; and crop rotations. Certain lines of work were in cooperation with the U. S. Department of Agriculture.

Experiments with lime, fertilizers, and varieties of field crops in the cotton and peanut section of Virginia, E. T. BATTEN and T. B. HUTCHESON (*Virginia Sta. Bul. 284 (1932), pp. 21, fig. 1*).—The fertilizer, liming, and varietal experiments reported supplement work noted earlier (E. S. R., 48, p. 333).

Results of the fertilizer studies indicated that in a good rotation including legumes the entire fertilizer application for cotton should be made before planting, with about half of the nitrogen from organic and half from inorganic sources. Side dressings of an inorganic nitrogen and potash would be profitable on thin, light soils. At least two-thirds of the nitrogen for corn should be applied as side dressings, preferably one application at knee height and another before the last cultivation. Comparatively large quantities of potash seemed to be needed by cotton and peanuts, especially on light soils. Only high grade potash salts should be used in fertilizers to be applied to peanuts just before planting. Phosphorus evidently was beneficial to all crops grown in the section.

From 1,500 to 1,800 lbs. of ground limestone or its equivalent once in four years was found to give best results in a rotation of cotton, corn, peanuts, and soybeans. For the crops included in the experiments, ground oyster shells and dolomitic limestone appeared of about equal value. Land plaster for peanuts could be eliminated safely where sufficient lime was applied.

The trials of crop varieties indicated Dixie soybeans for very early, Haberlandt for medium early, and Tokyo or Brown for late hog pasturage; Trice, Ingold, and Mexican cotton in the order named; Clarage corn for a very early crop, Golden Queen or Lancaster Sure Crop for medium early, and Virginia White Dent, Lathams Double, or Biggs 7-Ear varieties for the main crop; and Jumbo peanuts for light soils, and Virginia Bunch or Runner for heavier types of soil.

[Field crops investigations in Wisconsin, 1930–31] (*Wisconsin Sta. Bul. 421 (1932), pp. 41, 44–47, 48–54, 75–77, figs. 5*).—Agronomic research (E. S. R., 65, p. 431) again reported on included breeding work with sweetclover, by R. A. Brink; genetic studies with sweetclover, by A. E. Clarke and Brink;

breeding work with corn in cooperation with the U. S. Department of Agriculture; variety tests with corn and improvement of hemp, by A. H. Wright; variety and breeding work with barley, by B. D. Leith; cultural tests with reed canary grass on drained marsh soil, by A. R. Albert; nitrogen fertilization of pastures, by G. B. Mortimer, E. J. Graul, and H. L. Ahlgren; study of the Hohenheim system of pasture fertilization, by D. S. Fink, Mortimer, and E. Truog; curing of tobacco by artificial heat, by J. Johnson and W. B. Ogden (E. S. R., 66, p. 226); the germination of tobacco seed (E. S. R., 65, p. 182); and weed control with chlorates, by E. J. Delwiche and A. M. Strommen.

Kaw—a new alfalfa, S. C. SALMON (*Jour. Amer. Soc. Agron., 24 (1932), No. 5, pp. 352, 353*).—The name Kaw was suggested for an alfalfa strain, Provence F. P. I. No. 34886, found in Kansas and Nebraska (E. S. R., 65, p. 148). Experiment Stations tests to possess superior resistance to bacterial wilt and low temperature, although yielding slightly less than some other varieties. Information by H. L. Westover indicated that this seed originally came from Turkestan.

Red clover (Trifolium pratense). A monograph [trans. title], H. NESSLER (*Wiss. Arch. Landw., Abt. A, Arch. Pflanzenbau, 5 (1931), No. 4, pp. 649–694, figs. 5*).—A detailed study of the characteristics of and relations between yield and other agronomic and plant characters of 21 strains of red clover from different sources in Germany is supplemented by information on the nomenclature, classification, botany, growth habits, life history, adaptation, cultural needs, and breeding of the crop. A list of 124 references is appended.

The relation of nitrogen, phosphorus, and potassium to the fruiting of cotton, M. NELSON and J. O. WARE (*Arkansas Sta. Bul. 273 (1932), pp. 75, figs. 3*).—The effects of nitrogen, phosphorus, and potassium upon the fruiting of cotton (Arkansas strains of Rowden) were studied from 1927 to 1931 on Pulaski fine and very fine sandy loam at Scott. Varying quantities of each element—nitrogen in 50, 100, 150, 200, and 300 lbs. of sodium nitrate per acre; phosphorus in 150, 300, 450, and 600 lbs. of 16 per cent superphosphate; and potassium in 20, 30, 60, and 80 lbs. of potassium chloride—were used on trial plats, while in each case the other two elements were supplied in uniform quantities equal to those of the checks. The check plats received 500 lbs. of 4–10–4 fertilizer per acre. In addition, each series included plats without fertilizer and plats supplied with only two elements.

The records of the development of fruiting parts showed that from the beginning of square formation in the nitrogen series the numbers of squares were increased somewhat by phosphorus and potassium, without nitrogen. While the lighter applications of nitrogen increased square setting materially, the heavier applications did not cause further increases in numbers or rate of development. Like increases occurred in the blooming stage, with the greatest increases per unit of nitrogen coming from the lighter applications, although the heaviest nitrogen treatments produced the most blooms during the season. Shedding was in proportion to the number of blooms set and largely independent of the treatments. Seed cotton yields, like the number of bolls set, tended to increase from no treatment to the highest applications, although the greatest yield increase per unit of nitrogen resulted from the smallest application.

The average percentages of earliness did not increase with larger nitrogen applications, although the quantity of early cotton usually was larger from the heaviest treatment. The size of bolls was increased decidedly and the lint in 100 bolls slightly by the lightest application of nitrogen, but further increments showed no positive effects. The weights of seed, lint index, lint percentages, and the staple lengths were affected only slightly by the several treatments.

Nitrogen and potassium, without phosphorus, increased the setting of squares, the number of blooms, and the bolls set, and increased yields substantially, while the addition of phosphorus to nitrogen and potassium showed only slight effects. Shedding was in proportion to the total number of blooms developed, and the percentage of shedding after various treatments showed no definite trend. The lowest application of phosphorus seemed to increase the percentage of earliness, whereas further additions were ineffective. Phosphorus appeared to increase slightly the size of boll and the lint in 100 bolls, but did not affect weight of seed, lint index, lint percentage, and staple lengths.

Potassium seemed to increase very slightly the numbers of squares, blooms, and bolls. The shedding in the potassium series was more variable than in the nitrogen or phosphorus series, and the percentages were slightly higher. Potassium appeared to raise yields and percentages of earliness slightly, had no appreciable effect upon size of bolls, lint in 100 bolls, lint percentage, or staple length, and had a very slightly reducing effect, if any, upon the weight of seed and lint index.

Seed selection in Sunrise kafir, J. B. Sieglinger (*Jour. Amer. Soc. Agron., 24 (1932), No. 5, pp. 411–416*).—Methods of selecting seed of Sunrise kafir, including (1) selected open-pollinated heads, (2) bulk seed from plats, (3) selfed heads, and (4) bulk seed from increase fields, were compared at Woodward, Okla.

Grain yields from selected open-pollinated heads slightly exceeded those from either bulk seed from small plats or from selfed heads, apparently as a result of isolation by selection of a strain producing more sucker heads. Bulk seed from a relatively pure increase field yielded as high as that from either method of seed selection. No progressive increase or decrease was noted in yield from continuous selection, from selfing seed heads, or from the continuous use of bulk seed, although some differences in the crops from the four methods were obtained in other agronomic characters. The advantages in selecting seed heads in a pure variety seemed to lie chiefly in maintaining the purity and uniformity of the crop.

Studies on the breaking strength of straw of oat varieties at Aberdeen, Idaho, L. L. Davis and T. R. Stanton (*Jour. Amer. Soc. Agron., 24 (1932), No. 4, pp. 290–300, fig. 1*).—The relative breaking strength of straw of oats varieties grown in 1929 and 1930 under irrigation at the Aberdeen, Idaho, Substation in cooperation with the U. S. Department of Agriculture was studied on a machine developed by Salmon (E. S. R., 65, p. 734). Under the conditions, the midseason and larger-strawed varieties appeared to develop the stronger straw. Breaking strength of straw was correlated significantly with weight of panicles, weight of grain, weight of straws broken, height of culm, and width of second leaf. A correlation coefficient of +0.863±0.30 was obtained between the breaking strength of straw of 32 registered improved varieties for 1929 and 1930 and +0.702 ±0.057 between the breaking strength of straw of standard varieties grown in nursery tests in 1929 and 1930. In general the varieties reputed as stiff strawed as determined by field observations showed the highest resistance to breaking in the mechanical straw strength tests.

The physiological behavior of regional strains of potatoes, J. J. Pieper (*Jour. Amer. Soc. Agron., 24 (1932), No. 4, pp. 300–311, figs. 4*).—Regional strains of Early Ohio potatoes grown in several latitudes in Illinois, Wisconsin, and Minnesota and (except the northern strain) but one year removed from the North were grown in comparison at the Universities of Illinois and Wisconsin. Several methods of cutting the seed were used.

The number of eyes per tuber gradually increased as the production region extended southward, but this probably had no significance in regard to yields when whole tubers were planted. The northern strains of potatoes produced fewer stalks per set than other strains. Based upon the number of stalks desired per hill and the influence of the region upon this characteristic, a definite line could be drawn separating the region of good seed production from that of poor seed production. Small sets were observed to produce fewer stalks than whole tubers when planted. Reducing the size of set had a greater effect on the southern- than on the northern-grown seed in reducing the number of stems per set. The plants from the northern seed were more vigorous than those from southern seed. The whole tubers gave the largest plants and transverse sections the smallest. The time required for shoots to emerge from the soil was longest for northern strains and whole tubers and shortest for southern strains and sections of a tuber. Since only strong, vigorous stems produced branches, it appeared that the branching habit might be associated with high yield.

Fertilizer ratios of ammonia, phosphoric acid, and potash for potatoes, I, II (*Virginia Truck Sta. Bul. 77 (1931), pp. 989–1032, figs. 10*).—Fertilizer experiments with potatoes are reported on jointly by the U. S. D. A. Soil Fertility Investigations and the station.

I. *Results of fertilizer ratio experiments with potatoes on different soil types*, B. E. Brown (pp. 994–1017).—Fertilizer mixtures, prepared in accordance with the triangle system of Schreiner and Skinner (E. S. R., 40, p. 126), were compared on three important soil types growing potatoes commercially, near Norfolk, Suffolk, and Cape Charles Va. The experiments on Norfolk fine sandy loam showed a combination of three plant food constituents to be superior to ratios containing only one or two. The order of importance was ammonia, potash, and phosphoric acid. A ratio approximating 6–6–4 found most suitable for early potatoes on this soil, checked closely with the 7–6–5 commonly used by commercial growers. Similar results were obtained on Moyock fine sandy loam, where the ratio approximating 6–6–4 also was indicated. The greater effectiveness of complete fertilizers was quite pronounced on Sassafras sandy loam, where the three plant foods were more nearly of equal importance, although ammonia exercised the greater influence. A ratio approximating 8–6–6 seemed most desirable for potatoes on this soil.

II. *Fertilizer ratio experiments at Onley, Virginia*, H. H. Zimmerley (pp. 1017–1032).—The effects of different combinations of ammonia, phosphoric acid, and potash on the yields of potatoes in rotation with corn and wheat were studied from 1920 to 1931 on Sassafras sandy loam at the Eastern Shore Substation. Ammonia appeared to be more important than phosphoric acid or potash in determining potato yields on this soil. Satisfactory yields were obtained only with mixtures containing at least 6 per cent of ammonia. The amount of rainfall from March 1 to June 30 was an important factor in determining the order of yield of the different fertilizer combinations. During seasons of moderate or heavy rainfall, the fertilizers carrying either 9 or 12 per cent of ammonia returned the highest average yields of U. S. No. 1 grade potatoes. The lesser importance of phosphoric acid and potash was shown by the fact that high yields were obtained with a wide range of phosphoric acid : potash ratios provided the mixture contained 9 or 12 per cent of ammonia. The 9–6–6 mixture gave the best average results. At the rate of 1,600 lbs. per acre this fertilizer furnished nutrients practically equivalent to those in 1 ton of a 7–5–5 mixture. This did not differ enough from the 7–6–5

mixture generally used for potatoes in eastern Virginia to warrant a change in analysis. However, fertilizer carrying slightly less ammonia might prove economical on soils kept highly fertile by additions of large quantities of nitrogen in legume cover crops or stable manure. High yields obtained by using large quantities of ammonia during four years of abundant rainfall indicated the advisability of applying ammonia for potatoes on the lighter soil types if the rainfall is particularly heavy in March and April.

Fertilization of early potatoes, J. E. Metzger and E. H. Schmidt (*Maryland Sta. Bul. 333 (1932), pp. 49–62, figs. 3*).—Fertilizer experiments with potatoes on Norfolk sandy loam and Norfolk sand at Snow Hill were concerned with sources of nitrogen and potassium, green manure, rates and methods of applying fertilizer, and concentrated fertilizers. See also earlier accounts by Houghland (E. S. R., 60, pp. 38, 421) and Smith (E. S. R., 56, p. 720).

Of different nitrogen carriers used in a 7–6–5 (new 6–6–5 analysis) fertilizer, no one source of inorganic nitrogen was entirely satisfactory when used alone. Best results were had from the combination of organic and inorganic forms with the latter in the greater proportion. Newer forms such as urea and Leunasalpeter appeared suitable for inclusion in potato fertilizers. The green manure supplied by cowpeas and soybeans could not maintain an adequate supply of nitrogen either alone or supplemented by as much as 3.5 units of nitrogen. In fertilizer mixtures, 5 units of potash gave better results than 8 or 10 units. Potassium chloride appeared superior to manure salts and to potassium sulfate.

The fertilizer (7–6–5) placed in the row was more effective than an equal quantity applied as a side dressing at the first cultivation. When well mixed with the soil in the row, little injury resulted from the fertilizer coming in contact with the set. Evidence obtained indicated that the usual methods of applying fertilizers are not practical for high analysis fertilizers. Over a period of five years, 1,000 lbs. of double strength fertilizer (14–12–10) in which all of the nitrogen was derived from urea and the phosphorus from 20 per cent material produced a slightly better yield than 2,000 lbs. of 7–6–5.

The analysis of variance illustrated in its application to a complex agricultural experiment on sugar beet, J. Wishart (*Wiss. Arch. Landw., Abt. A, Arch. Pflanzenbau, 5 (1931), No. 4, pp. 561–584*).—The analysis of variance procedure is illustrated by its use in interpreting the results of a fertilizer experiment carried on with two varieties of sugar beets at Rothamsted in 1929.

Washing and halving sugar beets preparatory to sugar and purity determinations, J. G. Lill (*Jour. Amer. Soc. Agron., 24 (1932), No. 4, pp. 333–336, figs. 2*).—A machine built at the Michigan Experiment Station washes the sugar beet samples and another saws the individual beets into halves. With these machines, washing and halving the beets were speeded up materially and the operating costs were reduced to a minimum.

Studies of soybeans and other green manure crops for sugarcane plantations, G. Arceneaux, N. McKaig, Jr., and I. E. Stokes (*Jour. Amer. Soc. Agron., 24 (1932), No. 5, pp. 354–363*).—Experiments conducted at the U. S. Sugar Plant Field Station near Houma, La., in 1930, to determine the fresh weight, dry weight, and nitrogen content of several legume crops planted on different dates and at different rates and harvested at varying stages of maturity demonstrated that for best results in the sugarcane rotation soybeans should be planted in early spring. Early-planted Biloxi soybeans yielded the maximum green matter and dry matter and nitrogen per acre when in the full bloom stage, between August 1 and 15. The Biloxi variety appeared to be better than Otootan for green manure. *Crotalaria juncea* reached its optimum stage for turning

under at about 110 days after planting, approximating the full bloom stage. The best seeding rates were from 25 to 35 lbs. per acre for Biloxi and about 20 lbs. for Otootan. *C. usaramoensis*, *C. anagyroides*, *Cajanus indicus*, and *Centrosema plumieri*, all new to Louisiana, showed promise as green manure crops.

The wheat species: A critique, A. E. WATKINS (*Jour. Genetics, 23 (1930), No. 2, pp. 173–263, figs. 19*).—A critical account of knowledge found in research on the systematics, genetics, and cytology of the wheat species and of their behavior when crossed is presented with a bibliography of 133 titles.

Commercial agricultural seeds, 1931, J. M. BARTLETT ET AL. (*Maine Sta. Off. Insp. 142 (1931), pp. 81–113*).—The purity, germination, weed seed content, and in the case of legumes the hard seed percentage are tabulated for 218 samples of agricultural seed collected from dealers in Maine in 1931.

HORTICULTURE

[Horticulture at the Moses Fell Annex Farm], H. J. REED and H. G. HALL (*Indiana Sta. Circ. 191 (1932), pp. 10–16, figs. 2*).—Brief comments are presented on the results of varietal trials with peaches and plums, a cost study of portable and stationary spraying outfits, the use of ice for cooling apples, residues from arsenate of lead and substitute materials, tests with an apple washer, various washing materials and methods, and on results secured with a demonstration farm garden, with data on plant and seed requirements.

[Horticulture at the North Dakota Station], A. F. YEAGER (*North Dakota Sta. Bul. 256 (1932), pp. 41–44, fig. 1*).—Herein are briefly discussed the results of breeding and selection studies with sweet corn, tomatoes, squash, Chinese cabbage, and green-sprouting broccoli; varietal trials with gooseberries, grapes, red raspberries, and various ornamentals; and breeding studies with the chokecherry pollinated with other species of Prunus.

[Horticultural investigations at the Texas Station], S. H. YARNELL, R. A. HALL, P. R. JOHNSON, R. H. STANSEL, R. H. WYCHE, D. L. JONES, F. GAINES, J. J. BAYLES, H. F. MORRIS, J. R. QUINBY, J. C. STEPHENS, W. H. FRIEND, J. F. WOOD, C. H. MCDOWELL, L. E. BROOKS, E. MORTENSEN, and L. R. HAWTHORN (*Texas Sta. Rpt. 1931, pp. 106–108, 111, 112, 117, 118, 121–123, 126, 144, 145, 148, 149, 150, 155, 156, 164, 165, 166–169, 170, 176, 177, 178–181*).—The results are presented of studies at College Station upon the effect of fertilizers on the development of tomato pockets and on berry breeding and varietal trials with peaches, plums, and iris; at Beeville on citrus fruits, plums, peaches, cabbage, and tomatoes; near Tyler on variety tests with bell peppers, development of wilt resistant tomatoes, and the nature of tomato puff; at Angleton on variety and pruning tests with figs, variety tests with pecans, peaches, plums, pears, persimmons, apples, and citrus fruits, tests of 22 varieties of mustard, pollination experiments with the crapemyrtle, and varietal tests of various ornamental shrubs; at Beaumont on variety tests with oranges, kumquats, and lemons, and pruning tests with figs; at Lubbock on varietal tests of various ornamentals, including the Chinese elm and Chinese arborvitae; at Balmorhea on variety tests with grapes, melons, tomatoes, and numerous ornamentals; at Nacogdoches on plat technic trials with tomatoes, variety tests of tomatoes, blackberries, and ornamentals, and breeding studies with the cantaloupe; at Chillicothe on tests with various trees and shrubs; at Weslaco on the irrigation, pruning, fertilizing, and spraying of grapefruit, variety tests of various citrus species, tests of citrus rootstocks, varietal and cultural tests with tomatoes, cabbage, grapes, figs, bananas, avocadoes, papayas, and ornamentals,

fertilizer trials with tomatoes, nature of tomato pockets, varietal and propagation studies with dates, and storage tests with oranges and grapefruit; at Iowa Park on variety tests with fruits, vegetables, and ornamentals; and at Winter Haven on variety tests with fruits, vegetables, and ornamentals, citrus rootstock trials, strawberry irrigation tests, tomato spacing, onion fertilizers, and use of paper mulch.

[Horticulture at the Wisconsin Station] (*Wisconsin Sta. Bul. 421 (1932), pp. 42–44, 47, 72–75, figs. 2*).—The results are presented of date, rate, and depth of planting trials with canning peas and pea breeding investigations, by E. J. Delwiche; pure line and recombination breeding of sweet corn, by N. P. Neal and R. A. Brink; rootstock studies with apples, by R. H. Roberts; the effect of shading and its influence on nutrition on the fruit set of sour cherries, by Roberts and L. Langord; and winter hardiness trials with strawberries and raspberries, by J. G. Moore.

Insecticides and fungicides, 1931, J. M. Bartlett et al. (*Maine Sta. Off. Insp. 142 (1931), pp. 114–120*).—The results are presented of the analyses of a total of 80 samples of insecticides and fungicides collected in 1931.

The effect of fertilizers on the handling qualities and chemical analyses of strawberries and tomatoes, G. W. Cochran and J. E. Webster (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 236–243*).—Pressure readings at the Oklahoma Experiment Station on strawberries grown in concrete bordered beds receiving differential fertilizer treatment showed little or no variation that could be attributed to the fertilizer. Yields were highest on the plat receiving a 10–5–0 (NPK) mixture at the rate of 1,000 lbs. per acre. The largest berries were produced on the 10–5–3 plat. Analyses of strawberries from the different plats showed no conspicuous difference, with some evidence that berries which showed the highest pressure test were invariably highest in total pectin.

Observations on the handling quality of Bonny Best tomatoes grown under differential fertilizer treatments showed that the fruit from the check plat shipped best. Analyses of tomato fruits showed no consistent differences correlated with fertilizer treatment.

Beans for New York, W. T. Tapley and W. D. Enzie (*New York State Sta. Circ. 135 (1932), pp. 23, fig. 1*).—Summarized from a larger publication (E. S. R., 67, p. 525), this circular presents information on types and varieties of garden beans, describing some of the more important varieties in detail.

Percentage of hardshell in pea and bean varieties, W. O. Gloyer (*New York State Sta. Tech. Bul. 195 (1932), pp. 20, fig. 1*).—Determinations of the percentage of impermeable or hardshell seeds in a large number of pea and bean varieties stored under laboratory conditions showed marked variation not only between varieties within a species but between different lots of a single variety. In the case of peas no marked differences were found between smooth and wrinkled seeded varieties. No correlation was apparent between the color of the seed coat and the degree of hardshell. The author believes that the tenderness of the seed coat of processed products is often correlated with a ready diffusion of water into the dry seed coat and may therefore be one of the factors determining quality. It is considered possible that the progeny showing the least hardshell may also have the tenderest seed coats, and it is suggested that seedsmen who desire to improve quality should consider the hardshell character of the seed.

Celery culture in eastern Virginia, M. M. Parker (*Virginia Truck Sta. Bul. 78 (1932), pp. 1033–1050, figs. 5*).—A general discussion, supported by experimental results in certain instances, upon the culture of celery, from the planting of the seed to the harvesting and marketing of the crop. In a comparison

between root pruning, no root pruning, potting, and spotting in the greenhouse bench, it was found that the potted plants produced the largest mature plants and the highest percentage of prime celery, but the difference was not great enough to warrant recommendations. Relative to pH requirements of celery, plants grown in muck soil of pH 6 were the heaviest and tallest. At pH 4.5 growth was greatly inhibited, and at pH 6.6 there was a decided reduction below that at pH 6.

Response of sweet corn to varying temperatures from time of planting to canning maturity, C. A. Magoon and C. W. Culpepper (*U. S. Dept. Agr., Tech. Bul. 312 (1932), pp. 40, figs. 12*).—Based on data derived from plantings in Virginia, Iowa, Maine, and New York correlated with official temperature readings, the authors conclude that the most satisfactory air temperature base line varies with different varieties and strains and with the regions in which grown. For the varieties under study the range of satisfactory minimum temperatures was from 50 to 60° F. The fact that some corns have lower minimum temperature requirements than others indicates that certain varieties may not only be adapted for growing in regions of short growing periods but may also be planted earlier than the dates commonly assigned for planting. Corn subjected to drought conditions did not show as great a developmental response to prevailing temperatures as the same variety and strain enjoying ample rainfall.

Using the same temperature base lines for the same varieties grown in Maine and New York as at Arlington Experiment Farm, Virginia, it was found that northern-grown corn reaches the canning stage with a far smaller temperature unit summation than does corn in Virginia. Differences in rate of respiration, length of day, and intensity and quality of the light are among the suggested possible causal factors for such variation. When soil temperature at Arlington, Va., was used as a basis for calculations, the most satisfactory base lines were found to fall approximately 5° below those for air temperature.

Parthenocarpy in the cucumber, W. J. Strong (*Sci. Agr., 12 (1932), No. 11, pp. 665–669, figs. 2*).—Observing in two tests, in which ideal conditions of soil fertility, moisture, and temperature were maintained, that all the varieties of cucumbers grown set some fruits parthenocarpically, accurate records were taken on all the pistillate blooms on one plant each of 27 varieties. There was noted a wide variation in the capacity of the varieties to form parthenocarpic fruits, yet no variety completely lacked in this capacity, making it impossible to obtain strictly parthenocarpic types for crossing. The author concludes that parthenocarpy in the cucumber can be influenced to a certain extent, depending on the variety, by changing the environment.

Respiration studies with lettuce, K. A. McKenzie (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 244–248*).—In this study at the Washington Experiment Station the author found that immature lettuce respires more rapidly in the beginning than does mature lettuce, but gradually approaches the same level. Concerning the effect of temperature, it was found that at 4.4° C. the respiration rate increased about 100 per cent over that at 0°, and at 25° about 400 per cent over that at 4.4°. The higher the temperature the nearer to unity was the respiration ratio. Analyses of gases in closed and open jars indicated that an increase in the percentage of carbon dioxide surrounding lettuce tended to reduce further production of carbon dioxide.

Lettuce from a tipburn affected field showed a higher respiration intensity than that of healthy plants. Determination of the occluded gases from (1) solid, mature lettuce obtained direct from the field, (2) comparable heads stored at 15.5° for 40 hours, and (3) immature heads showed the percentage

of carbon dioxide in the descending order given. The stored lettuce had the highest respiration rate, although all three lots were low in this respect.

Head lettuce in New Hampshire, R. B. Dearborn and J. R. Hepler (*New Hampshire Sta. Circ. 39 (1932), pp. 8, figs. 6*).—General information based on the results of experimental studies is presented on varieties, culture, harvesting and packing, cost of production and marketing, etc.

Some effects of wounding onion bulbs on seed production, A. L. Wilson (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 336–341; abs. in Utah Sta. Circ. 100 (1932), p. 11*).—Mother bulbs of Sweet Spanish onions cut in several ways resumed growth more quickly and in every instance produced more seed than did the controls. The only exceptions during a 7-year period were when a freeze and a windstorm injured the early plants from cut bulbs and delayed their maturity.

Relation of age and of seasonal conditions to composition of root, petiole, and leaf blade in rhubarb, C. W. Culpepper and J. S. Caldwell (*Plant Physiol., 7 (1932), No. 3, pp. 447–479, figs. 5*).—In this study, conducted by the U. S. Department of Agriculture upon the biochemical changes occurring in the roots, petioles, and leaf blades of rhubarb in the course of its seasonal growth, leaf mesophyll and petiole tissues were found to be practically devoid of starch at all stages, and sugar content was always low in both these tissues. Nitrate nitrogen was present in extremely small amounts in the young leaves, but increased considerably after growth was completed. The petioles contained more nitrates than did the blades, attaining in the stage of senescence a nitrate nitrogen content equivalent to 1.53 per cent of the dry weight, with no evidence that the nitrate is used or translocated. As was expected, acid content was very large. In some instances the titratable acids, calculated as malic, constituted from 18 to 25 per cent of the dry weight of the petioles, which were more acid at all stages than were the blades.

Development of the foliaceous cotyledons of Cucurbita maxima, H. C. Nelson (*Iowa Univ. Studies Nat. Hist., 14 (1932), No. 6, pp. 19, pls. 4, figs. 2*).—The results are presented of anatomical and microchemical studies at the University of Iowa of the developing cotyledons of the Hubbard squash. Where cotyledons were removed 5, 10, and 15 days after planting, growth was retarded in the order of the earliness of their removal. No inhibiting effect was noticed when removal was made at the 20-day stage.

An analysis of the characters of the inflorescence and the fruiting habit of some varieties of greenhouse tomatoes, A. G. B. Bouquet (*New York Cornell Sta. Mem. 139 (1932), pp. 42, figs. 15*).—Three types of inflorescences, (1) simple raceme-like clusters, (2) dichotomous, or two-forked clusters, and (3) polychotomous, or those having more than two branches, were observed in this study involving a determination of the fruiting habit and the several characters of the inflorescence of tomatoes in relation to fruit production. The difference between the three types of clusters depended upon whether fruit was borne on a single peduncle or on two or more united peduncles. The simple type of inflorescence occurred more frequently on the lower clusters in all the varieties studied. The simple cluster was found dominant over the dichotomous in all varieties except Earliana. Plants apparently produced from 8 to 9 clusters in from 60 to 88 in. of growth, depending on the variety. Branched clusters had a blossom-producing capacity practically twice that of simple clusters. The size of the cluster was variable, being apparently more or less an independent unit. Clusters of average size are deemed more desirable than either extreme for producing marketable tomatoes. The length of pistils was found to vary considerably in varieties.

Fruit breeding: A method of recording and analyzing data, H. L. Lantz (*Amer. Soc. Hort. Sci. Proc.*, 28 (*1931*), *pp. 97–102*).—The methods employed by the Iowa Experiment Station in keeping and utilizing records on fruit seedlings are discussed.

Pollination of fruit trees, R. Wellington (*New York State Sta. Circ. 132* (*1932*), *pp. 23, fig. 1*).—Based on observations at the station and on those reported by other investigators, the pollination requirements are presented for a large number of varieties of apples, pears, plums, and cherries.

The Empire fruit industry, W. G. Freeman (*Bul. Imp. Inst.* [*London*], *30* (*1932*), *No. 2, pp. 160–185, figs. 5*).—A general discussion relating to the origin, nature, and value of fruit imports into the United Kingdom.

Apple breeding: Statistical analysis of apple breeding material, S. W. Edgecombe and H. L. Lantz (*Amer. Soc. Hort. Sci. Proc.*, *28* (*1931*), *pp. 93–96*).—In this contribution from the Iowa Experiment Station there are presented the generalized results from statistical studies of 40 crossbred apple progenies involving 3,238 seedlings from 8 to 11 years old. Neither height nor spread was found reliable in predicting the opposite character in the same year or different years. Caliper at planting was not found a safe basis from which to predict individual values for height, spread, volume, and trunk circumference later on, although useful for predicting average values. Trunk circumference appeared to be an unreliable measure of vigor in crossbred apple seedlings where there was considerable variability in shape and size.

Pollination of certain apple bud sports in north central Washington, E. L. Overholser and F. L. Overley (*Amer. Soc. Hort. Sci. Proc.*, *28* (*1931*), *pp. 74–77*).—Several of the newer red colored bud sports were included in these tests, conducted by the Washington Experiment Station. Blackjon, King John, Red Rome, Jonathan, and Rome Beauty proved to be satisfactory pollinizers for Delicious, whereas Red Stayman, Richared, Shotwell Delicious, Starking, and Winesap did not give good results. Golden Delicious pollen gave inconsistent results on Delicious. Red Winesap appeared of doubtful value for pollinating Delicious. Delicious, Richared, Starking, Golden Delicious, King John, and Red Rome were found compatible with Winesap, and Red Stayman and Stayman of little or no value. Richared set well with King David, McIntosh, Ortley, Rome Beauty, and Winter Banana but not well with Delicious, Starking, or Shotwell Delicious. That wind is of little significance in pollination was indicated in a set of only 2 out of 566 emasculated uncovered Richared blooms. For Starking, Blackjon, Golden Delicious, and White Pearmain were satisfactory pollinizers.

Pollination studies with some newer apple varieties, H. E. Knowlton (*Amer. Soc. Hort. Sci. Proc.*, *28* (*1931*), *pp. 71–73*).—At the West Virginia Experiment Station Starking, Red Rome, Lowry, York Imperial, Jonathan, and Delicious were found good pollinizers for Northwestern Greening. Rome Beauty and York Imperial proved to be practically self-sterile, Lowry was a good pollinizer for Delicious, and Red Rome and Northwestern Greening for York Imperial. Some indication was obtained that Starking and Red Rome gave somewhat higher sets on Delicious and Rome Beauty, respectively, than were obtained when the varieties were selfed.

Composition of current and previous season's branch growth in relation to vegetative and reproductive responses in Pyrus malus L., W. Thomas (*Plant Physiol.*, *7* (*1932*), *No. 3, pp. 391–445, figs. 5*).—In this study, conducted at the Pennsylvania Experiment Station, samples of current and previous season's growth taken at different seasons from Stayman Winesap trees growing in metal rims (E. S. R., 67, p. 253) were separated into bark and wood and analyzed separately to determine what internal conditions might be associated with external responses induced by differential fertilizer treatment.

The concentration of simple sugars was much lower in the case of trees which did not receive nitrate of soda than in nitrated trees. The storage of starch was relatively great up to fall in the no-nitrogen trees, while the accumulated starch reserves of the trees receiving nitrate of soda diminished rapidly as growth proceeded. In relation to fertilizer treatment starch accumulation followed the ascending order NPK, NK, N, PK, P, and check. Starch storage apparently caused a retardation of growth. The total available carbohydrates followed the same order with respect to fertilizer treatment as did starch. Total nitrogen decreased rapidly during the period of active growth and accumulated in the fall. The application of nitrate of soda resulted in a greatly increased utilization of starch. The percentage of ash in relation to fertilizer treatments was in the descending order of NPK, NP, NK, PK, N, P, and check. Despite a high potassium content in the original soil, potassium sulfate increased the potash content of the tissues, and both potash and phosphorus resulted in an increased utilization of starch. The amount of water in the tissues followed the descending order of NPK, NP=N, NK, PK, P, and check.

Further observations on factors affecting fruit setting of the McIntosh apple in New Hampshire, L. P. Latimer (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 87–92; also New Hampshire Sta. Sci. Contrib. 35 [1931], pp. 87–92*).—Further experiments (E. S. R., 65, p. 341) conducted by the New Hampshire Experiment Station in two locations in which McIntosh trees inclosed in cages were hand-pollinated with various varieties, including new kinds, such as Medina, Cortland, Milton, Lobo, Melba, and Red Gravenstein, showed quite constant varietal behavior, irrespective of the locality. Gravenstein and Red Gravenstein were poor pollinizers for McIntosh, and selfing also gave inferior results. Delicious and its progeny Medina and Orleans were quite satisfactory. Milton, Cortland, Lobo, Melba, and Fameuse ranked much the same and were quite satisfactory.

In respect to influence on seed development, Delicious was the leading pollen parent, with an average on one tree of 9.5 seeds in each McIntosh apple fertilized. Gravenstein, Red Gravenstein, and McIntosh pollens resulted in apples with an average of 2.6, 2.3, and 3.6 seeds each and often lopsided in shape. Spur set rather than flower set is deemed the better criterion of successful pollination.

The persistence of winter injury in certain Delicious hybrids, H. E. Nichols and H. L. Lantz (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 103–106*).—Observations at the Iowa Experiment Station following a severe freeze which occurred in late October, 1925, while trees were still in active growth, showed considerable winter injury to young trees of such varieties as Golden Delicious, Stayman, Jonathan, Grimes Golden, and Delicious. Bark splitting at the ground was noted soon afterward, and the cambium or the outer layers of the xylem showed browning. An examination in 1930 of 1,496 seedlings having Delicious as one parent and which had passed through the 1925 freeze showed evidence of injury in approximately 50 per cent. Where Delicious was crossed with hardy varieties there was less injury than with tender pollen parents. For example, in Delicious × Anisim 74.4 per cent were uninjured and in Delicious × Jonathan only 23.2 per cent.

The fertilization of apple orchards.—III, A comparison of nitrate of soda and sulphate of ammonia, H. E. Knowlton and M. B. Hoffman (*West Virginia Sta. Bul. 252 (1932), pp. 12, figs. 2*).—In this, the third of a series (E. S. R., 56, p. 535), there are presented the results of a comparison of nitrate of soda and sulfate of ammonia in three orchards located in different counties.

In a mature Rome Beauty orchard in Pleasants County there was found no significant difference between the two fertilizers if applied some time before bloom. However, when both were applied at bloom the nitrate of soda was more effective. With both fertilizers early application was superior to that made at blooming time.

In the experiment in a Berkeley County orchard consisting of 9-year-old Jonathan trees both fertilizers were applied at bloom, and in this case the nitrate of soda was significantly more effective both in growth and fruit production.

When fertilizers were applied from 2 to 3 weeks before bloom in a 25-year-old Black Twig orchard in Jefferson County no difference was found in growth and only slightly significant differences in yield in favor of the sulfate of ammonia.

Soil-acidity determinations made in the Pleasants and Jefferson County orchards showed a definite increase in acidity in the plats fertilized with sulfate of ammonia. In the Jefferson County orchard the difference in lime requirement following 5 years of fertilizer application averaged 1,800 lbs. per acre.

Practical suggestions on the nitrogen fertilization of orchards are included.

Nitrogen and carohydrate metabolism of young apple trees as affected by excessive applications of sodium nitrate, N. W. Stuart (*New Hampshire Sta. Tech. Bul. 50 (1932), pp. 26, figs. 15*).—Utilizing as material for study 2-year-old Baldwin apple trees set in April, 1931, and so paired that one-half of the trees received 1.5 lbs. each of nitrate of soda and the others none, the author found material differences in the chemical composition of the leaves of the two groups. The excessive nitrogen application caused some injury, usually manifested in slight scorching of some of the leaves. Nitrates were found in appreciable quantities in the scorched foliage and were absent from the controls, suggesting that the nitrate fraction may have been the causal factor of the scorch. Cursory examination of the roots revealed no apparent differences between those of the fertilized and unfertilized trees. Differences between the nitrated and the control trees with respect to other nitrogen fractions were not so distinct. Ash was found to be considerably higher in the leaves of the nitrated trees. Carbohydrates were lower in the foliage of the nitrated trees, and calculations of the carbohydrate-nitrogen ratio showed a preponderance of carbohydrates to nitrogen in the control trees, with the reverse in the nitrated trees.

As measured by the diameter of the trunk, the nitrated trees made the larger growth. It is conceded possible that the application of excessive amounts of nitrogen may have disrupted the balance between nitrogen and other elements or may have interrupted the normal organic metabolism of the plant, resulting in foliage injury. The specific nature of the toxic substance causing the injury remains unknown.

Dusting vs. spraying of apples, 1927–1931, C. L. Burkholder (*Indiana Sta. Bul. 356 (1931), pp. 28, fig. 1*).—Working in an orchard of Grimes Golden, Jonathan, Stayman Winesap, and Rome Beauty apples 18 years old at the beginning of the experiment, the author found that dusts did not control apple scab or codling moth as well as did liquids in any of the five seasons. Heavy rainfall in April and May rendered 14 applications of colloidal dust ineffective in the control of scab, whereas when rainfall was light during the same period dusts gave good control. Either dusts or sprays applied during the blooming period greatly increased scab control on susceptible varieties. The foliage was the finest on trees receiving dust or flotation sulfur liquids. In 1930 and 1931

dry lime sulfur-sulfur dust and flotation sulfur dust were as effective as colloidal dust in the control of apple scab, and flotation sulfur paste and wettable sulfur gave as good control as did lime-sulfur spray.

A review of some of the more recent results of dusting and spraying apples in other States is appended.

Studies in apple storage.—I, The influence of fungicides on flavour and sugar content, J. F. Hockey and R. W. Ward (*Sci. Agr., 12 (1932), No. 12, pp. 709–715*).—In this study at the Dominion Laboratory of Plant Pathology, Kentville, Nova Scotia, McIntosh, Ribston, Stark, and Northern Spy apples from experimental spray plats were stored in an ordinary ventilated warehouse and later tested for sugar content and firmness. With all four varieties, fruits which had been sprayed with Bordeaux mixture had a higher content of total sugar than did the unsprayed. Lime-sulfur on the other hand had no appreciable effect on sugar content, this being practically that of the controls. As concerns the firmness of the fruit, there was some indication that aluminum sulfate and Bordeaux mixture increased this characteristic, suggesting the possibility that either of these materials may lengthen the effective storage life of apples.

Cold storage tests with McIntosh under forced air circulation, E. J. Rasmussen (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 568–571, figs. 3; also New Hampshire Sta. Sci. Contrib. 36 [1931], pp. 568–571, figs. 3*).—Observations at the New Hampshire Experiment Station on McIntosh apples stored at from 31 to 32° F. in rooms cooled with coils and with blowers showed no significant difference in firmness, acidity, or color between the apples in the two types of refrigeration. Brown core and breakdown, however, were considerably more serious in the fruits stored in the coil room, a fact explained by the greater variation in temperature in the coil room and the slower rate of cooling of fruit when first placed in the room. The loss of weight was slightly greater in apples cooled by the blower type of refrigeration.

Electrical resistance of pear tissue as an index of maturity, J. C. Moore (*Oregon Sta. Bul. 300 (1932), pp. 18, figs. 4*).—Presenting a description of a portable apparatus for determining the electrical resistance of pear fruit tissues, the author reports the results of field studies in southern Oregon with Bartlett, Bosc, and Anjou pears.

Rapid changes occurred in the electrical resistance of pear tissues just prior to optimum picking condition. The resistance of the tissues to electrical pressure increased quite rapidly from July 31 to August 4, and since changes in physical pressure were not marked until August 7 to 11, it is suggested that the electrical tests may be more sensitive in detecting changes.

Resistance determined in Bartlett pears in storage showed only slight changes during the first month, but at the end of 45 days a rather sharp decrease was noted, which, from observations on similar fruits removed from storage, is assumed to have been the onset of core breakdown. The same general trends were observed in Anjou and Bosc but were slower in becoming evident.

Owing to a severe drought that prevailed during the period of the study, the results are held incomplete but do indicate that the degree of maturity of pears may be measured electrically.

Bud variation in peaches, A. D. Shamel, C. S. Pomeroy, and F. N. Harmon (*U. S. Dept. Agr. Circ. 212 (1932), pp. 3–5*).—The first sentence of the previous abstract (E. S. R., 67, p. 134), "An examination of a total of 7,897 peach trees growing in commercial orchards in California, including important canning varieties, revealed 70 well-marked-limb and entire-tree variations, some of

which were improvements over the parent variety," should read "An examination of peach trees growing in commercial orchards in California revealed many well marked limb and entire tree variations, some of which were improvements over the parent variety."

Peach growing, O. EINSET (*New York State Sta. Circ. 133 (1932), pp. 16, fig. 1*).—General information is given on culture, varieties, etc., and a section on diseases is presented by W. O. Gloyer and one on insect pests by D. M. Daniel. In a comparison between hand and open pollination of the J. H. Hale peach, hand pollination gave the greater number of fruits, but these averaged less in weight, 3.79 oz., as compared with 4.64 oz. for open pollinated fruits.

Sweet cherry pollination in Washington for 1931, L. L. CLAYPOOL, F. L. OVERLEY, and E. L. OVERHOLSER (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 67–70*).—Experiments conducted by the Washington Experiment Station at Grandview, Selah, and Wenatchee showed the three important varieties of cherries, Bing, Lambert, and Napoleon, to be completely self-sterile and also intersterile but to respond favorably to certain pollinizers, such as Deacon, Black Tartarian, Black Republican, Norma, and Montmorency. Of these, Deacon is considered outstanding because of its market value, being similar in color and shape to Bing. Montmorency is deemed of no real value as a pollinizer because of the fact that it normally blooms from 5 to 10 days later than the sweet cherries.

Outlook for the sweet cherry, F. M. COE (*Better Fruit, 26 (1932), No. 9, pp. 5, 6, fig. 1; abs. in Utah Sta. Circ. 100 (1932), p. 11*).—An analysis of the 1930 census figures on cherry acreage and planting in Oregon, Utah, Idaho, California, and Washington showed an increase of 55 per cent in number of trees during the decade, from 2,175,564 in 1920 to 3,368,659 in 1930. The need of limiting production and decreasing market costs is stressed.

Arsenical spray residue on cherries, R. H. ROBINSON (*Oregon Sta. Bul. 298 (1932), pp. 15, fig. 1*).—The heavy residues following the repeated spraying necessary to combat cherry fruit fly led to a study of such residues and their removal. The amount of arsenious oxide per pound of fruit was found to range from only a trace to six times the accepted tolerance. The type of spray, amount applied, and rainfall occurring during the ripening period apparently determined to a large extent the amount of residue. Washing with dilute hydrochloric acid was found to reduce the arsenic residue effectively below the prescribed tolerance. Water gave practically as good results as the acid washes, but simply spraying the trees with water did not prove sufficiently effective. The washing employed in the ordinary cannery in preparing cherries was found effective in reducing residues, but it is suggested that cannery men should subject fruit to actual test.

Results of a seven year plum thinning experiment, G. H. DICKSON (*Sci. Agr., 12 (1932), No. 11, pp. 646–651, fig. 1*).—At the Ontario Horticultural Experiment Station, Vineland, seven varieties of domestica plums, Reine Claude, Gueii, Duane, Pond, Washington, Lombard, and Yellow Egg, were thinned so that no fruits contacted at maturity. At the end of seven years of thinning there was no significant evidence that thinning tended toward annual bearing. In the Reine Claude thinning did increase yields over nonthinned trees by odds of 112 to 1, due apparently to the better health of the thinned trees. In most cases thinning increased the size of fruits and was materially beneficial in reducing losses from brown rot. Heavy yields tended to delay maturity, and the following spring blooming was retarded.

The plum in New York, L. M. VAN ALSTYNE (*New York State Sta. Circ. 134 (1932), pp. 16, fig. 1*).—A presentation of general cultural and varietal information.

Self-unfruitfulness in Prunus tomentosa, G. L. SLATE (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 112, 113*).—Studies at the New York State Experiment Station showed *P. tomentosa* to be largely self-unfruitful but successfully cross-pollinated.

Chromosome behavior as a factor in berry breeding, S. H. YARNELL (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 114–117*).—Attempts at the Texas Experiment Station to improve the Nessberry by outcrossing, with later inbreeding, were greatly handicapped by an inability to secure fertile progeny. Presumably the Nessberry is a tetraploid and when crossed with diploids gave rise to triploids with unbalanced chromosomes. In the Nessberry × Early Harvest blackberry cross the introduction of a new parental species (*Rubus laudatus*) gave further stimulation to sterility.

Cytological examinations of buds of 26 plants of the F_2 progeny of Nessberry × Hailsham red raspberry showed 2 diploids and 24 tetraploids. Of this progeny approximately half was completely self-fertile. An examination of the pollen mother cells of these fertile plants showed only slight irregularities. It is considered probable that maternal inheritance may be a factor in raspberry breeding, since plants precisely like the mother were not uncommon. The need for complete fertility resulting from chromosome compatibility as a prerequisite to successful combination of desirable characters from diverse sources is emphasized.

Red raspberry pollination technique, M. B. HARDY (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 122–124, fig. 1*).—A brief account is given of the procedure followed in emasculating and pollinating red raspberries at the Western Washington Experiment Station.

Self and cross fertility of red raspberry varieties, M. B. HARDY (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 118–121*).—Microscopic examination at the Washington Experiment Station of the pollens of Cuthbert, King, Marlboro, Lloyd George, Latham, and Antwerp raspberries showed 10, 50, 65, 95, 60, and 90 per cent of normal appearing grains, respectively. The total percentages of the several pollens to germinate in 10 per cent glucose solution were 7.5, 35, 19.5, 52.3, 15, and 72, respectively. In controlled pollinations good sets of fruit were obtained with all six varieties used in various combinations, with some suggestion that Lloyd George and Cuthbert are particularly effective pollinizers. It is concluded that the raspberries displayed complete or almost complete self- and cross-fertility.

The best parents in strawberry breeding, G. L. SLATE (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 107–111*).—Tabulated data on the parentage and results in terms of promising seedlings of a large number of strawberry crosses made at the New York State Station showed Howard 17 to be an outstanding parent. Clermont, a named seedling of Marshall × Howard 17, was also valuable, while other progenies of the same cross were only moderately successful. Marshall gave poor results as a parent except when combined with Howard 17. Of all the crosses made Howard 17 × Beacon was the most successful, yielding 26.3 per cent of promising seedlings.

Effect of age of plant on flower production and yield of strawberries in North Carolina, E. B. MORROW and J. H. BEAUMONT (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 206–210, fig. 1*).—Investigations conducted by the North Carolina Experiment Station in 1931 on the relation of age of runner plants to flower and fruit production in the Blakemore, Klondike, and Missionary strawberries showed that in general as the age of plant increased the average number of flowers and berries per plant and yield per acre also increased.

Blakemore plants were the most productive of blossoms and fruits and bore the largest berries. Size of berry was inversely proportional to the number per plant, so that younger runners with their lesser number of fruits produced the largest fruits.

Growth of Concord grape cuttings in relation to vigor, chemical composition, and relative position on the cane, V. C. CALMA and H. W. RICKEY (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 131–136, pl. 1*).—In this study, conducted at the Iowa Experiment Station, Concord grape cuttings taken from the less vigorous canes produced the largest amount of roots and had the highest percentage of cuttings making such growth. No marked difference in chemical composition was noted in relation to the vigor of the parental canes. In general the terminal sections of the canes were lowest in the percentage of total carbohydrates, with a maximum occurring at some midpoint, possibly nearer the base than the tip. Those cuttings with the highest percentage of total carbohydrates produced the most roots in storage. The greatest amount of tops and roots and the highest percentage of cuttings forming roots and tops occurred in those taken from the midportion of strongly vegetative canes and the basal half of moderately and weakly vegetative canes. Callusing apparently was independent of rooting.

Further studies on the effect of fruiting on the shoot growth of the Concord grape, A. L. SCHRADER (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 137–142*).—Contrary to earlier results (E. S. R., 67, p. 259), the author found in this study at the Maryland Experiment Station that the removal of clusters before setting did not stimulate the growth of the fruiting shoots, due apparently to favorable conditions obtaining at the time. When the growth of the vine as a whole was considered, cluster removal for two successive years, especially before setting, did increase growth. However, the growth increase of vines which were prevented from bearing fruit for two successive years was not great, and leads to the conclusion that the vegetative condition of the vine and the degree of root competition are likely contributing factors to the problem. Where weak and vigorous vines were completely defruited, the growth response was relatively greater in the weaker vines.

Effects of pruning on fruiting of shoots and the growth of their terminals and laterals in the Concord, A. S. COLBY and L. R. TUCKER (*Amer. Soc. Hort. Sci. Proc., 28 (1931), p. 143*).—In studies at the Illinois Experiment Station the total amount of shoot length was but little influenced by the severity of the preceding winter's pruning, but the vigor of individual shoots was proportionately increased. In vigorous shoots this increase was in growth of laterals and in weak shoots the length of the shoot itself. The capacity of a bud to yield was largely determined the preceding year. Vines pruned to 56–65 nodes were able to carry large bunches to full maturity each year and at the same time mature a sufficient number of middle sized, well placed shoots for the next season.

Irrigation experiments with grapes, A. H. HENDRICKSON and F. J. VEIHMEYER (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 151–157, figs. 3*).—Studies conducted by the California Experiment Station with Sultanina and Emperor grapes showed that growth and fruiting proceed in a normal manner if a supply of readily available moisture is maintained in the soil. Fluctuations of moisture from field capacity to permanent wilting percentage induced no response unless the latter stage was continued for a considerable period. Since berries of both Sultanina and Emperor reached approximately full size several weeks before maturity, irrigation late in the season could not influence

size. Maturity changes in both varieties proceeded regularly under the varied soil moisture conditions. Grapes from plats irrigated more frequently than necessary were fully as good keepers as those from vines not watered from 2.5 to 3 months prior to harvest.

A preliminary report on the breeding of vinifera grape varieties, E. SNYDER (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 125–130, fig. 1*).—In this brief account of methods employed by the U. S. Department of Agriculture in its grape breeding work near Fresno, Calif., it is stated that in the 8 years that the work has been in progress there have been originated 587 seedlings, of which 117 have fruited. The Gros Guillaume × Monukka cross yielded no seedlings with reflex stamens, while Alexandria × Monukka produced 2 reflex out of every 7. Observations were made also on color, shape of berry, time of ripening, and inheritance. White × white yielded all whites and white × black all blacks. The seedless varieties Monukka, Sultanina, Sultanina Rosea, Panariti, Corinthe Rose, and Corinthe Blanc were used extensively as pollen parents in an attempt to develop seedless varieties.

Relative transpiration rates in citrus leaves, A. R. C. HAAS and F. F. HALMA (*Bot. Gaz., 93 (1932), No. 4, pp. 466–473, figs. 4*).—Studies at the Citrus Experiment Station, Riverside, Calif., upon the comparative transpiration rates of leaves of rooted Eureka lemon, Marsh grapefruit, and Valencia orange cuttings showed the most rapid water loss in the lemon, followed in order by the grapefruit and orange. About 2 to 3.5 times as much water was transpired through the lower as the upper leaf surface, with some variation according to species. Observations on detached leaves of the same species showed the same general trends.

Performance records of pecan varieties in North Carolina, J. H. BEAUMONT, M. E. GARDNER, and R. SCHMIDT (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 167–172, figs. 2*).—A summation is presented of pecan variety tests conducted by the North Carolina Experiment Station at the Upper and Lower Coastal Plain Branch Stations. There was noted a tendency toward biennial fruiting at the Upper Coastal Plain Station. No correlation was found between total annual or total summer rainfall and yields. Varieties differed so markedly with respect to the relationship between percentage of meat and yield that no generalizations could be drawn.

Some characteristics of pecan varieties as determined by cracking test, M. E. GARDNER and J. H. BEAUMONT (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 164–166*).—Data are presented by the North Carolina Experiment Station on the number of nuts per pound, percentage of meat, cracking quality, thickness of shell, and general quality of a total of 24 varieties of pecans. Monarch had the largest nuts, Schley the largest proportion of meat, and Schley and Centennial are rated of highest quality.

Anatomical differences in pecan varieties that fruit differently, A. H. FINCH (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 158–160*).—Studies by the University of Arizona in the Yuma Valley upon the causes of the failure of pecans to develop into nuts properly showed that varieties differed markedly in this respect, abnormal fruits being common in the Kincaid and Halbert varieties and limited in Burkett, Schley, Success, Clark, and others. Nuts collected from strong and weak shoots of Kincaid, Halbert, and Burkett showed a considerably higher percentage of poorly filled nuts from the weak shoots of the first two varieties and little or no difference in Burkett.

Anatomical studies of shoots of different varieties showed differences in the proportion of parenchyma to fibers in the outer xylem of shoots of different varieties. Those varieties with high parenchyma to fiber ratios were those

commonly having a low proportion of sticktight or abormal nuts. The shoots collected in October differed in starch content according to variety, and it is deemed likely that the rate or time of carbohydrate and starch formation, or the degree to which it occurs, may have an important bearing on nut filling.

Endosperm and embryo development as related to filling of pecans and walnuts, D. V. SHUHART (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 161–163, pl. 1*).—At the Oklahoma Experiment Station it was observed that the period of rapid enlargement of the embryo of pecans usually occurs about September 1 and covers approximately 6 weeks. Cytological studies of the development of the embryo and endosperm showed the endosperm to develop before the embryo and to continue its growth after the embryo had started. The removal of leaves from fruiting shoots after the embryo was from one-third to one-half grown did not stop development, there apparently being sufficient food in the nut to enable growth to continue. A large amount of carbohydrate was observed in the liquid of the vacuole of the endosperm.

The effect of steaming the soil on yields of carnations, S. W. DECKER (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 413–415, fig. 1*).—Steaming of the soil was found in these studies at the University of Illinois to increase the yield of carnations on both old and new soils. New soil when steamed yielded 11 per cent more blooms than did new soil without such treatment, and the stems were somewhat longer, with little or no difference in the diameter of the flowers.

Flower bud differentiation in the gladiolus, J. V. WATKINS (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 407–409, pls. 2*).—Anatomical studies at the University of Florida of flowering size corms taken from the field and from storage at repeated intervals indicated that flower bud differentiation in the gladiolus occurs shortly after growth has started and not in the preceding growing period, as is the case in most fruits. After the rest period was completed and growth had started definite activity was observed at the growing point. This early development was characterized by substantial broadening of the growing point, together with a lobing that is believed to be the first evidence of the formation of the lowest florets.

Gladiolus varieties in floriculture trial gardens at Iowa State College, E. C. VOLZ and D. C. FAIRBURN (*Iowa Sta. Bul. 288 (1932), pp. 385–403, figs. 2*).—In connection with notes on the origin and development of the modern gladiolus a list of varieties is recommended for planting in Iowa, and a total of 258 varieties are briefly described.

Factors influencing the flower color of hydrangeas, R. C. ALLEN (*Amer. Soc. Hort. Sci. Proc., 28 (1931), pp. 410–412*).—At Cornell University light-proof caps placed over *H. macrophylla* blooms prevented the development of the normal pink coloration, the sepals of the covered blooms being pure white. Of various chemicals sprayed on the blooms aluminum sulfate was the only one to affect color, changing mature pink blooms to blue wherever contact was made. When buds were sprayed several times with aluminum sulfate it was possible to secure blooms of fairly uniform blue. The injection of aluminum sulfate into the stems of normally pink flowered plants influenced color, and if a fairly deep cut was made near the base it was possible to obtain completely blue umbels.

Roses in the garden, C. H. CONNORS (*New Jersey Stas. Circ. 251 (1932), pp. 31, figs. 15*).—This publication supersedes Circular 172 (E. S. R., 52, p. 741).

Rockeries, F. L. MULFORD (*U. S. Dept. Agr. Leaflet 90 (1932), pp. 8, figs. 9*).—A brief discussion of various types of rock plantings, their preparation, plant materials, etc.

FORESTRY

A comparison of the results obtained with forest-pulled and nursery-grown planting stock in northern Minnesota, T. SCHANTZ-HANSEN (*Jour. Forestry, 30 (1932), No. 4, pp. 406–408*).—Observations in an experimental planting of white and Norway pines, established at the Cloquet Forest Experiment Station in 1914–15 and in which part of the trees were forest-pulled stock, showed no great superiority for nursery stock either in survival or growth when planted under 40-year-old jack pines. The forest-pulled white pines showed 52 per cent survival at 15 years as compared with 64 and 61 per cent for the 2–0 and 2–2 transplants, respectively. Under the same conditions the figures for Norway pine were 46, 22, and 50 per cent, respectively. When planted on cut-over land forest-pulled stock of both white and Norway pines showed heavy losses compared with nursery stock, it being apparent that some overhead shade such as furnished by the jack pines was distinctly beneficial, especially to the pulled seedlings.

Transpiration capacity of coniferous seedlings and the problem of heat injury, J. ROESER, JR. (*Jour. Forestry, 30 (1932), No. 4, pp. 381–395, figs. 3*).—In these studies, carried on by the U. S. D. A. Forest Service at its Rocky Mountain Experiment Station, it was found that lodgepole pine and Engelmann spruce seedlings during their first year transpired more freely than western yellow pine and Douglas fir. Engelmann spruce and Douglas fir proved more efficient than the pines in their use of water only when in an extremely quiescent state induced by low temperature and high humidity, a condition normal to seedlings of these species. Under conditions of extreme exposure western yellow pine was apparently more quickly stimulated to increase its transpiration than was any of the other three species, and is therefore apparently well adapted to meet the demands made upon it in its early life by the xerophytic conditions of its natural habitat.

The use of paper mulch in the forest nursery and field plantations, P. W. ROBBINS (*Jour. Forestry, 30 (1932), No. 4, pp. 415–418*).—As determined by the Michigan Experiment Station, the high cost per acre for establishing plantations with paper mulch placed about each tree does not warrant its use in forest field work. Results were more favorable in the nursery, but the reduction in weeding and cultivating costs was not sufficient to offset the cost of the paper despite the fact that it increased the total dry weight of the seedlings and produced better trees.

The calcium content of Connecticut forest litter, W. U. GARSTKA (*Jour. Forestry, 30 (1932), No. 4, pp. 396–405, figs. 2*).—Determinations of the calcium content of 38 samples of very slightly decomposed and quite definitely unhumified forest litter collected in different locations in Connecticut showed a remarkable degree of uniformity in the total and replaceable calcium contents of widely separated samples and from different soil types but of the same forest type. Replaceable calcium content varied quite uniformly with the total calcium content, the ratio being 0.489, based on an average of 90 analyses. Total calcium content was apparently as reliable an indication of calcium needs as was replaceable calcium. Up to the oak-hickory-hardwoods type total calcium content increased generally with the advance of the forest types toward the climax (hemlock-hardwoods). A correlation was indicated between Connecticut forest associations in their trend toward the climax and the calcium content of the litter.

The drying rate of hardwood-forest leaves, M. E. DUNLAP (*Jour. Forestry, 30 (1932), No. 4, pp. 421–423, figs. 2*).—Simulating the relative humidity and air

movement of the forest, data were obtained by the U. S. D. A. Forest Products Laboratory on the drying rate of leaves of 12 hardwoods, including 6 oaks. Prior to drying the leaves were brought to a saturated condition by soaking over night in water but despite this treatment they dried sufficiently in 1 hour to become inflammable.

Establishment and survival of yellow poplar following a clear cutting in the southern Appalachians, I. H. SIMS (*Jour. Forestry, 30 (1932), No. 4, pp. 409–414, figs. 3*).—Studies conducted near Asheville, N. C., by the Appalachian Forest Experiment Station of the U. S. D. A. Forest Service, indicated that the yellow poplar may be prevented from reproducing after cutting by root and light competition with fern growth and the existing stand. Of four types of quadrats, (1) clear-cut and burned, (2) clear-cut but not burned, (3) burned but not cut, and (4) neither burned nor cut, the clear-cut burned area was found most favorable to reproduction. At the end of the seventh growing season there were on the acre basis 87 yellow poplar seedlings over 6 in. tall on this quadrat, as compared with 36 for the clear-cut unburned area and none of this size on the other two quadrats.

Does light burning stimulate aspen suckers? II, H. L. SHIRLEY (*Jour. Forestry, 30 (1932), No. 4, pp. 419, 420*).—Following an earlier paper (E. S. R., 65, p. 837), in which was reported a definite stimulation in both number and height of aspen suckers following light surface burning, the author presents further confirmatory evidence. The beneficial effects were, however, found to disappear after the first year, the difference apparently being due to the increased heat absorption of the blackened ground surface.

The establishment, growth, and influence of shelter belts in the prairie region of Minnesota, E. G. CHEYNEY (*Minnesota Sta. Bul. 285 (1931), pp. 36, figs. 5*).—Incorporating general information with relation to the planning, planting, and care of windbreaks and choice of species, the author presents data on the growth of various species, the effects of cultivation on growth, etc.

Green ash was found especially vigorous and the freest from injury of all species tested. Soil moisture readings within and without windbreaks showed somewhat less moisture inside. Determinations of soil moisture beneath various species showed slight but inconsistent and insignificant variation. Soil temperatures taken within and without windbreaks showed higher temperatures in the open at both 1- and 2-ft. depths. Measurements of wind velocity showed a marked reduction as the result of the windbreak, the ameliorating influence being noticeable to an appreciable degree 600 ft. beyond the trees. Relative humidity within the windbreak averaged considerably higher than in the open.

Good cultivation increased the growth of most species from 10 to 50 per cent, but mulching proved of no value during the first 3 years after planting. It was noted that river bottom species, such as the willow, cottonwood, boxelder, and silver maple, do not live as long on the prairie as in their native habitat.

Comparison of the effects of temperature on the radial and longitudinal electric polarities in wood and cortex of the Douglas fir, E. J. LUND (*Plant Physiol., 7 (1932), No. 3, pp. 505–516, figs. 5*).—As determined in this study at the University of Texas, the longitudinal and radial E. M. F.s in the intact stem below the apex are greatly decreased by lowering the temperature and increased by raising it. Dead stems were not influenced by temperature. On changing nearly simultaneously the temperature of the wood and of the cortex, it was evident that the cortex is the seat of an electric polarity oriented in the opposite direction to that of the wood. The cortex of the apical region was more sensitive to changes in temperature as measured in E. M. F.s than was

that of the basal region. In all cases the regions having the highest relatively electropositive condition with respect to the external circuit were affected the most by temperature changes.

What is the growth per cent of American forests? H. F. Morey (*Jour. Forestry, 30 (1932), No. 4, pp. 424–428*).—Growth percentages computed by the U. S. D. A. Forest Service for 17 American species at the age at which mean annual growth in board feet culminated showed a range of from 0.8 for lodgepole pine in the Rocky Mountains to 7.7 for cottonwoods in the Mississippi Valley. Within a single species, *Pinus strobus*, there was noted a great variation in growth according to the place where the original records were obtained.

An alinement-chart method for preparing forest-tree volume tables, L. H. Reineke and D. Bruce (*U. S. Dept. Agr., Tech. Bul. 304 (1932), pp. 28, figs. 13*).—Discussing the procedure and technique in preparing forest tree volume tables by the alinement chart method, the authors point out the superiority of this new method to the older ones of fitting harmonized curves or using frustrum-form factors. The new procedure is said to be applicable to any type of table, whereas the frustrum-form factor method was restricted to tables of volume in board feet based on merchantable height. The alinement chart method is self-checking, the aggregate difference being obtained by the simple addition of two columns of figures in one of the work sheets. A lesser number of data is required to reach a given degree of accuracy, or using the same number the accuracy is materially increased.

The suitability of Reineke's planimeter method for volume determinations of Delta hardwood species, R. K. Winters and P. R. Wheeler (*Jour. Forestry, 30 (1932), No. 4, pp. 429–434, figs. 2*).—As reported by the Southern Forest Experiment Station of the U. S. D. A. Forest Service, the planimeter method was found to give consistently lower volumes by 1.22 per cent for Delta hardwood species than were obtained by the use of the Smalian formula. It is concluded, however, that the planimeter method approaches more closely the effective cubic volume of the stem for utilization purposes.

Sampling Douglas fir reproduction stands by the stocked-quadrat method, R. W. Cowlin (*Jour. Forestry, 30 (1932), No. 4, pp. 437–439*).—The satisfactory results obtained with the stocked quadrat method indicated that this gives not only a correct interpretation of actual conditions in the forest but also is of simple application in the field and of easy analysis in the office.

Elements of forest mensuration, H. H. Chapman and D. B. Demeritt (*Albany, N. Y.: J. B. Lyon Co., 1932, pp. 452, figs. 92*).—A general discussion.

Ohio Forest News, [July, 1932] (*Ohio Forest News [Ohio Sta.], No. 18, (1932), pp. 8, figs. 2*).—Brief comments are given on forestry activities, clubs, planting, fire control, species of arborvitae under test, etc.

DISEASES OF PLANTS

Manual of bacterial plant pathogens, C. Elliott (*Baltimore: Williams & Wilkins Co., 1930, pp. IX+349*).—"The material presented . . . is the outgrowth of a card catalogue of bacterial diseases of plants accumulated through a number of years and assembled. . . . It is intended here to place the emphasis on the causal organism and to bring together in one publication a complete alphabetical list of bacterial plant pathogenes and associated organisms, together with their synonyms and the source and date of publication of each name. This alphabetical list has been divided into two parts. The first part includes the plant pathogenes and a few possible pathogenes, with a description of each organism and much of the available information on each disease.

The second part is made up of nonpathogenic organisms associated in some way with plant diseases and included in the literature and published here merely as a source of reference. . . .

"In order that the various pathogenic organisms may be more readily compared, a chronological list has been prepared giving the chief morphological, cultural, and physiological characters of the organisms arranged in the form of a chart. . . .

"Until such time as a general system of bacterial nomenclature is adopted or generally accepted, it seems to be least confusing to follow the system of nomenclature under which the largest number of bacterial plant pathogenes have been named. Smith's modification of Migula's system has, therefore, been followed in the present list."

Environmental factors in relation to plant disease and injury: A bibliography, J. D. WILSON (*Ohio Sta. Tech. Bul. 9 (1932), pp. 203*).—A bibliography is given of more than 3,700 papers which make reference to the influence of environmental factors which are either directly or indirectly harmful to plants. The list is arranged alphabetically by the names of authors, and in separate sections references to the environmental factors are grouped. A host-disease-injury index is given.

The influence of nutrition on the susceptibility of plants to parasitic attack, II [trans. title], E. SCHAFFNIT and A. VOLK (*Phytopath. Ztschr., 1 (1929), No. 6, pp. 535–574, figs. 14*).—A first phase of this research, which has been noted (E. S. R., 62, p. 146), referred mainly to herbaceous cultivated plants. The present account refers chiefly to woody plants.

An effective control of plant diseases—a great economic world problem, J. ERIKSSON (*Phytopath. Ztschr., 1 (1929), No. 3, pp. 361–365*).—Emphasis is placed on present lack of knowledge, annual losses, and need for international cooperation in measures for control of plant diseases.

Reaction of cells to fungus haustoria [trans. title], J. DUFRENOY (*Phytopath. Ztschr., 1 (1929), No. 5, pp. 527–531, figs. 11*).—In parasitized cells, the first symptoms observable occur in the vacuole and its appurtenances. The penetration of a hypha causes the vacuole, previously surrounded by protoplasm, to retract, invaginate, or divide. Other changes are particularized.

Cytological studies on virus diseases [trans. title], J. DUFRENOY (*Phytopath. Ztschr., 1 (1929), No. 2, pp. 151–167, figs. 14*).—Cytological studies have shown in cells affected with virus disease a primary phase of metabolic excitation. The vacuole breaks up into smaller portions, showing contacts with mitochondria which manifest activity, either dividing or developing into plastids.

A second phase appears to be characterized by an inhibition of the elaborative functions with persistence of the function of digestion. The carbohydrate figures disappear, and the lipo-protein complexes are dissociated with freeing of the lipids and the production of organic acids in the course of katabolism.

On the resistance of Neurospora crassa, A. F. FAULL (*Mycologia, 22 (1930), No. 6, pp. 288–303, fig. 1*).—Studies are indicated of material obtained from burned stumps of *Dichrostachys nutans* in Cuba in 1925, kept dry for nearly three years, then revived, cultured, and studied under laboratory conditions. The fungus proved to be *N. crassa*. It was noted that the ascospores even when unheated germinate in from 3 to 4 hours, that the Monilia stage is positively heliotropic, and that the markings on the walls are not "ridges" but lighter differentiated parts of the wall. The behavior at different temperatures is noted. It is concluded that *N. crassa* is a generally resistant fungus, not a thermophile requiring heat in its development, but resistant to extreme cold as well as to extreme heat and other adverse conditions.

Studies of fungicidal substances [trans. title], L. PASINETTI (*Riv. Patol. Veg.*, *19* (*1929*), *No. 9–10*, *pp. 193–213*, *pl. 1*).—In this account, limited to tests with Fideol No. 1, it is stated that at strengths of 0.5, 1, and 2 per cent no deleterious effects regarding germination were observable in case of seeds in several plant families named, including grains and legumes.

The stimulating action observed as regards germinability and vegetative vigor in the laboratory tests requires confirmatory experimentation in field procedure.

The activation of dust fungicides by external factors [trans. title], A. VOLK (*Phytopath. Ztschr.*, *1* (*1929*), *No. 5*, *pp. 533, 534*).—This report deals briefly with the effectiveness of dry fungicides on different kinds of soil, with changing water content on different soils, on soils differing as to reaction and fertility, and on soils at different temperatures.

Diseases of grain and forage crops in North Dakota, W. WENIGER (*North Dakota Sta. Bul. 255* (*1932*), *pp. 97*, *figs. 31*).—This is a revision by W. E. Brentzel of Bulletin 166 of the station (E. S. R., 49, p. 343).

Plant pathology, W. E. BRENTZEL (*North Dakota Sta. Bul. 256* (*1932*), *pp. 47, 48*, *fig. 1*).—Brief notes are given of investigations on bunt of wheat and scab, scurf, and mosaic diseases of potatoes.

Plant pathology and physiology (*Texas Sta. Rpt. 1931*, *pp. 59–73, 129, 130, 131, 132, 172–174, 178*).—Among the progress reports given of investigations conducted during the year are cotton root rot investigations, by J. J. Taubenhaus, W. N. Ezekiel, S. E. Wolff, J. F. Fudge, W. J. Bach, H. E. Rea, H. Dunlavy, [B. F.] Dana, C. H. McDowell, and L. E. Brooks; tomato diseases, sulfur and sulfur compounds as fungicides, core rot of freesias, carriers of cotton wilt, wilt resistant watermelons, and an unidentified injury of corn plants, by Taubenhaus and Ezekiel; and control of gummosis and scaly bark of citrus, late blight of potatoes and tomatoes, downy mildew of cantaloupes, and bacterial blight of beans, by Bach.

Plant diseases (*Wisconsin Sta. Bul. 421* (*1932*), *pp. 55–71*, *figs. 6*).—Progress reports are given on the following investigations: Dust treatments for controlling oat smut, by J. G. Dickson et al.; Stewart's wilt disease of corn, by S. S. Ivanoff and A. J. Riker; a method for measuring resistance to corn diseases, by Dickson; wilt resistant strains of peas, by J. C. Walker and W. C. Snyder; mosaic resistant canning beans, by Walker and W. H. Pierce; yellows resistant strains of cabbage, by Walker, L. M. Blank, R. H. Larson, and M. E. Anderson; effect of warm, moist weather on Rhizoctonia head rot of cabbage, by F. L. Wellmann and Walker; control of tomato leaf mold by lowering the temperature of greenhouses, by Walker and C. B. Sumner; a second toxic compound responsible for disease resistance in colored onions, by K. P. Link; soil insects as carriers of hairy root disease, by E. M. Hildebrand and Riker; use of tape for the control of root overgrowths caused by the hairy root and crown gall organisms, by Riker and Hildebrand; a caution regarding the use of sulfur sprays in hot weather, by G. W. Keitt and D. H. Palmiter; and the use of Bordeaux mixture in checking fire blight, by Keitt, L. Shaw, and Riker.

Parasitic fungi [trans. title], G. BURCHARD (*Phytopath. Ztschr.*, *1* (*1929*), *No. 3*, *pp. 277–315*, *figs. 27*).—These studies as here detailed dealt with *Moniliopsis klebahni*, the cause of a stem-weakening disease of conifer seedlings; *Didymella applanata*, the cause of a disease of raspberry vines; *Sclerotinia tuberosa*, causing injury to *Anemone nemorosa*; and *Stachybotrys klebahni*.

Bacteria associated with Plasmodiophora brassicae [trans. title], T. FEDOROWA (*Phytopath. Ztschr.*, *1* (*1929*), *No. 2*, *pp. 195–211*, *figs. 2*).—The author notes records of the appearance of bacteria in association with *P. brassicae*,

the cause of slime mold disease conditions in crucifers. Outlining his own researches in this connection, he states that in case of cruciferous rootlets before infection with *P. brassicae*, as also in the first stage of such infection, no bacteria of the rot-producing sort were obtainable, the first evidence of the presence of rot bacteria being notable 4 days after the occurrence of visible indications of the infection. Evidences of the rot then remained visible for from 1.5 weeks to 5 months.

The formation of the outgrowths is the result of the life activity of *P. brassicae* without the collaborative action of the bacteria. Spore germination in *P. brassicae* can take place without participation of the rotting bacteria, the presence of which is to be regarded as accidental.

The separation of spores of *P. brassicae* from the accompanying bacteria is accomplished by placing the diseased tissue for 5 minutes in 1:1,000 corrosive sublimate and then diluting at once with 20 times the volume of sterile distilled water.

The influence of nutrition in grain on attack by Erysiphe graminis [trans. title], G. SCHULZ (*Wiss. Arch. Landw., Abt. A, Pflanzenbau, 3 (1930), No. 3, pp. 371–388*).—This is said to be the result of a critical survey of the literature, considering the several bearings in this connection of such factors as variety, nutrition, and growth alterations.

Dependence of infection by cereal rust fungi on carbon dioxide content of air [trans. title], G. GASSNER and W. STRAIB (*Phytopath. Ztschr., 1 (1929), No. 1, pp. 1–30, pl. 1, fig. 1*).—Citing contributory or otherwise related views of findings, dating back as early as 1877, the authors state as the result of experimentation giving further facts that in absence of carbon dioxide no cereal rust development occurs, and that diminution from the normal carbon dioxide lengthens the incubation period and lessens the amount of infection experimentally obtained. Normal carbon dioxide content of air is sufficient for the success of infection of plants in the open, but a richer supply increases the infection and shortens the incubation period of the fungus.

Progress report on cereal scab development during the season of 1928, J. G. DICKSON, E. B. MAINS, and H. JOHANN (*Phytopathology, 19 (1929), No. 1, p. 108*).—Scab was reported serious on small grains in the Central States in 1928. Several varieties of wheat were found to have shown considerable re sistance to scab.

Preliminary results from cross inoculation and culture studies upon the fungus Rhynchosporium secalis (Oud.) Davis causing scald of cereals and other grasses, R. M. CALDWELL (*Phytopathology, 19 (1929), No. 1, p. 104*).—Isolations of *R. secalis* were made from barley, rye, *Agropyron repens*, *Bromus inermis*, and *Hordeum jubatum*. According to the author the last species had not been previously reported as attacked by the fungus. From data secured in his studies, it is considered that barley and rye in the vicinity of Madison, Wis., are each attacked by a distinct physiologic form of this fungus.

Biological forms of Puccinia graminis in northwest Russia [trans. title], D. N. TETEREVNIKOVA-BABAJAN (*Phytopath. Ztschr., 1 (1929), No. 4, pp. 457–463*).—A considerable number of grasses are known to be attacked by *P. graminis*, some biological forms of which are listed as previously known.

The work is herein reported as carried on during two years at the Phytopathological Station of the Leningrad Agricultural Institute in Detskoe Selo, and listings are given of plants susceptible or resistant to *P. graminis avenae*, *P. graminis secalis*, *P. graminis phlei-pratensis*, *P. graminis agrostis*, and *P. graminis tritici*. Differences in distributions and severities are indicated.

Further results of oat-smut control in Ohio, A. L. Pierstorff and J. D. Sayre (*Phytopathology, 19 (1929), No. 1, pp. 102, 103*).—Field and greenhouse tests showed the control of oat smut by dusting the seed with a 5 per cent formaldehyde dust at the rate of 3 oz. per bushel. It was not found necessary to make the treatment in closed containers, but it is recommended that the grain should be left in sacks over night before using.

Reaction of wheat varieties to flag smut, J. T. Pridham and R. E. Dwyer (*Agr. Gaz. N. S. Wales, 41 (1930), No. 6, pp. 413–415*).—A continuation is noted of tests at Bathurst, Cowra, and Wagga Experiment Farms with regard to relative flag smut resistance. The reaction of a given variety is determined by the greatest degree of susceptibility in any location, and the numerous varieties tested to date in New South Wales are listed according to reaction. On this plan, the present account lists as highly susceptible 45, as susceptible 93, as moderately resistant 16, as resistant 12, as highly resistant 31, and as immune Cedar, Dan, Dindiloa, Ghurka, Galgalos, Red Rock, Sindhi, Tuela, and Zealand Blue.

The rôle of humidity in the life cycle, distribution, and control of the loose-smut fungus of wheat, V. F. Tapke (*Phytopathology, 19 (1929), No. 1, p. 103*).—Attention is called to the fact that varieties of wheat extensively grown in the Pacific Northwest are seldom naturally infected by loose smut, but they were readily infected in a humid greenhouse near Washington, D. C. The relative humidities in the Northwest are usually so low at the time wheat is flowering that the fungus spores do not germinate. Withholding water at flowering time reduced, but did not control, loose smut of wheat in irrigated districts.

Some chemical and morphological phenomena attending infection of the wheat plant by Ophiobolus graminis Sacc., H. Fellows (*Phytopathology, 19 (1929), No. 1, pp. 103, 104*).—It is claimed that *O. graminis* penetrates wheat plants through the epidermis of the roots, subcoronal internode, and the coleoptile. Cell walls in the vicinity of the invading parasite become thickened or produce elongated protuberances, called by the author "lignitubers." Xylem walls may become plugged due to the thickening. Epidermal cells of the coleoptile may be thickened, and in the roots the thickenings are scattered. Other cells may become entirely disintegrated. Cellulose in the diseased roots is replaced by lignin and suberin. Other substances in the roots are not changed by the fungus.

Studies of certain soil phases of the wheat take-all problem, H. Fellows (*Phytopathology, 19 (1929), No. 1, p. 103*).—*Ophiobolus graminis* is said to occur in infested soils in Kansas to a depth of 10 in. Experiments showed that the most severe infections occurred when the inoculum was placed only an inch below the crowns of wheat plants. When placed 4 in. or more below the crowns, no injury occurred. The addition of organic matter to infested soil reduced the severity of the disease.

Behavior of wheat varieties toward Puccinia glumarum [trans. title], G. Gassner and W. Straib (*Phytopath. Ztschr., 1 (1929), No. 3, pp. 215–275, figs. 3*).—The conduct of comparative variety infection experiments, as here outlined, with yellow rust (*P. glumarum*) on wheat under glass is said to have supplied exact knowledge, which is herein detailed, as to the particular infection conditions for this wheat rust fungus species. It is thought that this work affords information of interest in heredity and breeding studies, usable in the development of resistant varieties.

Studies on physiologic specialization in Puccinia triticina, C. O. Johnston and E. B. Mains (*U. S. Dept. Agr., Tech. Bul. 313 (1932), pp. 22, figs. 2*).—The authors have brought together data on the physiologic forms of the leaf

rust of wheat (*P. triticina*), and they present a key and a table of infection types for 53 physiologic forms. Thirty-nine of these forms, occurring in North America, are described.

Data are presented showing that certain physiologic forms are variable in their expression. The distribution and prevalence of physiologic forms in the United States are believed to be, as far as known, independent of the occurrence of species of Thalictrum. Physiologic form 9 proved to be more prevalent and abundant in the southern Great Plains than other forms. In the eastern half of the United States forms 3 and 5 were more frequently found than form 9.

Some evidence is presented indicating that physiologic form 9 is particularly well adapted to conditions in the Great Plains. It is the form most frequently collected in late fall, winter, and early spring.

Breeding for immunity to wheat stripe rust [trans. title], W. RUDORF (*Phytopath. Ztschr., 1 (1929), No. 5, pp. 465–525, pls. 2, figs. 4*).—By means of artificial infection of wheat seedlings a considerable number of varieties were found which were resistant to stripe rust (*Puccinia glumarum tritici*), all in the 7-, 14-, or 21-chromosome series. The other characters of these forms are discussed.

Alfalfa wilt as influenced by soil temperature and soil mosture, B. KOEHLER and F. R. JONES (*Illinois Sta. Bul. 378 (1932), pp. 37–79, figs. 18*).—A report is given of three years' greenhouse studies under controlled conditions made in cooperation with the U. S. D. A. Bureau of Plant Industry of the effect of soil and air temperatures and soil moisture on the development of bacterial wilt of alfalfa caused by *Phytomonas insidiosum*.

The effect of soil and air temperature and soil moisture on the development of wilt in the alfalfa plant was found by comparing the effect of these environmental conditions upon infected and uninfected plants. The best growth of alfalfa, both for roots and for forage parts of healthy plants, was obtained at a soil temperature of 20° C. (68° F.) and at a soil moisture content which was 65 per cent of the moisture-holding capacity of the soil. Within the range of 10 to 30° soil temperature, the percentage of plants infected by inoculation with the wilt organism through cut stems increased with increase in temperature. The length of the life of the infected plants diminished with increase of temperature. The weight of the roots of the plants infected with the wilt organism was diminished more than the weight of the tops by the disease. Within the range of 35 to 80 per cent of the moisture-holding capacity of the soil, infection of the plants by the method used increased as the moisture content increased up to 65 per cent, but above this point there was no significant further increase in infection.

The wilt bacteria were found to develop in essentially the same manner in the plants grown at the different soil temperatures. Chemical analyses of the roots showed that the sugar content was considerably higher at 10° than at the higher temperatures. At 25 and 30° the sugar content was lower in the roots of inoculated plants than in the controls. The starch, hemicellulose, crude fiber, and nitrogen contents of the roots were influenced by temperature. Differences in soil moisture affected the sugar, starch, hemicellulose, and crude fiber contents of the roots. Infected plants showed a lower sugar content and a higher crude fiber content than did the plants not inoculated with wilt.

Observations on the stimulational physiology of the beet nematode [trans. title], B. RADEMACHER (*Wiss. Arch. Landw., Abt. A, Pflanzenbau, 3 (1930), No. 5, pp. 750–787, figs. 5*).—Immediate, delayed, summation, condition, and complex responses to different stimuli are dealt with, the resulting data being tabulated and analyzed, with conclusions in detail.

The question as to the identity of beet and of oat nematodes [trans. title], O. SCHMIDT (*Wiss. Arch. Landw., Abt. A, Pflanzenbau, 3 (1930), No. 3, pp. 420–464, figs. 9*).—A study was made of variation in nematodes, statistically from such host plants as *Avena sativa*, *Beta vulgaris*, and *Brassica campestris*; individually from such plants at *Triticum sativum*, *Hordeum sativum*, and *Solanum tuberosum*. Numerous differences are presented in tabular and discussional detail.

New fungi found on the Indian corn plant in Illinois, G. L. STOUT (*Mycologia, 22 (1930), No. 6, pp. 271–287, pl. 1*).—Of the 16 new forms of fungi reported as on *Zea mays* in Illinois, including *Ascochyta maydis*, *A. zeae*, *Coniothyrium zeae*, *Helminthosporium zeicola*, *Leptosphaeria maydis*, *L. variiseptata*, *L. zeae*, *Leptothyrium zeae*, *Mycosphaerella zeicola*, *Phaeocytosporella* n. g. and *P. zeae*, *Phyllosticta zeae*, *Physalospora zeae*, *Pleosphaerulina zeicola*, *Septoria zeae*, *S. zeicola*, and *S. zeina*, 14 appeared in association with spots on the leaves, and 2 on the stalks on or near the basal nodes. No one singly of the 16 is supposed to be very important economically as pathogenic on maize, though collectively they may injuriously reduce photosynthesis.

Further studies on Penicillium injury to corn, H. JOHANN (*Phytopathology, 19 (1929), No. 1, p. 105*).—Inoculation experiments with *P. oxalicum* are said to indicate that the fungus is not able to enter vigorous living cells, but the hyphae enter through injuries of any kind. Studies of lesions indicate that toxic substances injure or kill the cells in advance of the fungus. The fungus was found to develop oxalic acid in corn seedling decoctions. Apparently this is one way by which the fungus enters the host.

Seed transmisson of cotton wilt, J. J. TAUBENHAUS and W. N. EZEKIEL (*Science, 76 (1932), No. 1959, pp. 61, 62*).—The authors report having collected cottonseed from wilt-infected plants in the fall of 1929. The seed were stored in the laboratory, and in 1930 they were planted in uninfested soil in pots, one lot of the seed being treated with corrosive sublimate and the other lot untreated. Some wilt appeared in both lots. In 1931 the experiment was repeated, and a larger percentage of internally affected seeds was found. The organism recovered from various portions of the infected plants was identified as *Fusarium vasinfectum*. It was found in culturing the seeds from wilt-infected plants that many of the seeds which yielded the fungus failed to germinate, and it is considered probable that the disease could be transmitted by such dead seeds as well as inside the viable ones.

Chlorosis of hothouse cucumbers, an associated Cephalosporium and its ascospore stage [trans. title], H. KLEBAHN (*Phytopath. Ztschr., 1 (1929), No. 1, pp. 31–44, figs. 10*).—Cucumbers under forced growth in the hothouse showed a characteristic yellowing, wilting, and dying of the young fruits, soon followed by a stage showing the presence of a Cephalosporium. The conidial stage of this was studied, as was also its ascospore stage, which is named *Plectosphaerella cucumeris*.

Biologic control of the aphids Rhopalosiphum persicae Sulzer and Aphis gossypii Glover, J. A. B. NOLLA (*Phytopathology, 19 (1929), No. 1, p. 102*).—The author reports that *R. persicae* and *A. gossypii* were effectively controlled by means of the fungus *Acrostalagmus aphidium*, spore suspensions of which were sprayed on eggplants infested with the aphids.

A bacterial leaf rot of winter endive [trans. title], W. KOTTE (*Phytopath. Ztschr., 1 (1929), No. 6, pp. 605–613, figs. 5*).—A leaf-rotting disease of *Cichorium endivia*, appearing in the neighborhood of Freiburg in August, 1929, was found to be caused by a bacterium which is indicated as the new species *Pseudomonas endiviae*. A point of entrance was afforded by the uredo beds of

Puccinia cichorii. No part played by aphids in distribution could be proved. Apparently uninjured leaf epidermis is not penetrated. High moisture in the atmosphere favored the disease. The organism appears weakly pathogenic to *Lactuca sativa.*

A new form of Botrytis cinerea parasitic on seed of Linum [trans. title], F. H. VAN BEYMA THOE KINGMA (*Phytopath. Ztschr., 1 (1929), No. 4, pp. 453–456*).—Repeated tests of a Botrytis, found on seed of flax reduced severely as to germinability, are claimed to have resulted in the establishment of a new form of *B. cinerea*, which is named *B. cinerea lini.*

Resistance of varieties of wheat and flax to disease, H. L. BOLLEY (*North Dakota Sta. Bul. 256 (1932), pp. 26, 27, fig. 1*).—A progress report is given of experiments made to test the resistance to flax wilt of Argentine strains of flax.

Pseudoperonospora humuli, the cause of the new hop disease [trans. title], K. ARENS (*Phytopath. Ztschr., 1 (1929), No. 2, pp. 169–193, figs. 29*).—Outlining a history and study of *P. humuli* as to its relationship to certain other species, and as factoring in association with hop disease particularly in Japan, the author states that the infection occurs by way of the stomata in the leaves and in the young stems. Spraying should wet the under sides of the leaves as well as the upper sides, on which conidia may fall and be washed or blown to points of ingress.

A new truffle in beds of cultivated mushrooms, W. W. DIEHL and E. B. LAMBERT (*Mycologia, 22 (1930), No. 5, pp. 223–226, pl. 1*).—In May, 1929, attention was called to the presence of a fungus reported as "completely stopping the production of mushrooms" by a grower at Ashtabula, Ohio. Surface soil and compost manure were found to contain ascospores of an undetermined truffle. Similar infestations were found in Minneapolis, Minn., in Chester County, Pa., and in Rosendale, N. Y. This form is described as a new species and named *Pseudobalsamia microspora.*

Some effects of root rot on the physiology of peas, J. G. HORSFALL, Z. I. KERTESZ, and E. L. GREEN (*Jour. Agr. Research [U. S.], 44 (1932), No. 11, pp. 833–848, figs. 8*).—In this publication, which is a contribution from the New York State Experiment Station, the authors state that root rot due to various fungi affects the ripening quality of canning and market peas, and this led to a study of the changes in size, crushing resistance, dry matter, ash, nitrogen, and crude fiber in affected peas as contrasted with normal ones.

According to the maturity index value, diseased peas enlarged more rapidly at first than healthy ones, but soon the rates of enlargement began to lessen, so that the diseased peas never reached the maximum size attained by normal ones. After the growth of the diseased peas had begun to lessen their quality declined rapidly. The curtailment of growth and the lowering of quality were both intimately associated with the lowered water content of root-rot-affected peas.

The load necessary to crush one pea was much higher, size for size, on the same harvest date in the diseased than in the normal samples, indicating that the diseased peas were poorer in quality. On the basis of an equal percentage of dry matter, however, the diseased peas were much softer than the normal ones. This was due to the fact that they began to dry out before they were filled and thus were smaller, hence their resistance to crushing was less, and the dry matter itself was softer than that in normal peas. No significant difference was found in the crude fiber content of normal and diseased Perfection peas. The percentage of ash in the root-rot-affected peas on a dry matter basis was always lower than that of the corresponding healthy peas. The percentage of nitrogen on a dry weight basis was lower in practically every instance in diseased than in normal peas.

Extension in Africa of peanut leaf spot [trans. title], A. MALLAMAIRE (*Agron. Colon.*, *20* (*1931*), *No. 164*, *pp. 37–39*).—Extension in Africa is noted of the peanut leaf spot due to *Cercospora personata*, the areas now affected being portions of French West Africa and Cameroon.

The inactivation of mosaic disease virus by pulverizing infected tissue, P. K. OLITSKY and F. C. FORSBECK (*Science*, *75* (*1932*), *No. 1950*, *pp. 518*, *519*).—The authors report that prolonged comminution of mosaic-infected tomato plants by a method described resulted in the loss of infectivity of the virus. Studies were made of the possibility that oxidation and adsorption cause inactivation, but it was found that inactivation took place more quickly under anaerobic than under aerobic conditions and that adsorption probably was not a principal cause.

***Studies on the biochemistry of the potato rots.*—I, The influence of Phytophthora rot on the chemical composition of the potato tuber** [trans. title], E. LEPIK (*Phytopath. Ztschr.*, *1* (*1929*), *No. 1*, *pp. 49–109*, *figs. 15*).—An account is herein given of the composition as ascertained within the layers of the potato tuber and of the distribution of *P. infestans* in these layers. Among the effects noted, it is stated that the presence of Phytophthora rot eventuates in an increase of pentosan, methyl pentosan, and raw fiber, and a decrease of dry substance in the tuber. An accompanying increase of alkalinity is also noted. Changes in the starch grains are observable in the later stages. The interior parts of the tuber are attacked later than the outer. The outbreak of *P. infestans* is not conditioned by the chemical composition or water content of the tuber, but is dependent upon oxygen ingress. Exclusion of air stops the spread of the fungus in the potato tuber. The keeping in dry storage of the potato does not hinder the internal spread of *P. infestans*.

Potato tuber powdery scurf [trans. title], N. WILD (*Phytopath. Ztschr.*, *1* (*1929*), *No. 4*, *pp. 367–452*, *figs. 26*).—Literature cited as bearing on potato powdery scurf dates back as early as 1842, for which year and succeeding years contributions are listed to a total number of 260. In the studies here reported as carried on in Switzerland, all cases of potato powdery scab were caused by *Spongospora subterranea*, which enters the tuber by way either of the lenticels or of wounds. The course and behavior of the parasite are outlined. The principal secondary organism found was *Rhizoctonia solani*.

Potato virus diseases: Oregon investigations, 1924–1929, M. B. McKAY and T. P. DYKSTRA (*Oregon Sta. Bul. 294* (*1932*), *pp. 40*, *figs. 17*).—The results are given of six years' field and greenhouse studies with nine different virus diseases maintained on several varieties of potatoes. The chief symptoms and distinguishing characteristics are described for mild mosaic, interveinal mosaic, crinkle mosaic, rugose mosaic, leaf-rolling mosaic, leaf roll, spindle tuber, calico, giant hill, and witches'-broom.

Different methods of transmission were tested. The leaf-mutilation method was effective in transmitting mild mosaic, crinkle mosaic, rugose mosaic, leaf-rolling mosaic, calico, and spindle tuber. The core-graft method was effective in transmitting mild mosaic, crinkle mosaic, rugose mosaic, leaf-rolling mosaic, leaf roll, and spindle tuber.

Studies were made of the ability of four species of aphids to transmit various virus diseases. *Myzus persicae* successfully transmitted crinkle mosaic, rugose mosaic, leaf-rolling mosaic, and leaf roll. *Illinoia solanifolii* transmitted leaf-rolling mosaic and leaf roll, but with leaf roll it was less efficient than the other species of aphids. *M. pelargonii* transmitted leaf-rolling mosaic and leaf roll. *M. circumflexus* transmitted crinkle mosaic, rugose mosaic, and leaf roll. Rugose mosaic passed from diseased to healthy plants under insect-proof field

cages with the apparent absence of insects of any kind on the parts above ground, while mild mosaic, interveinal mosaic, and leaf roll were not transmitted under similar conditions. Giant hill was apparently not transmitted under similar conditions, but it appeared to be transmitted when the roots were disturbed by deep cultivation.

Roguing of seed plats by the tuber-unit method proved more effective in eliminating virus diseases than by the mass-roguing method. The tuber-indexing method proved to be the most effective means of eliminating virus disease from seed stocks, but it is considered impracticable for general farm use. The hill-indexing method proved unreliable as a method of effective control.

Virus or degeneration diseases of potatoes, C. J. Magee (*Agr. Gaz. N. S. Wales, 41 (1930), No. 6, pp. 405–412, figs. 4*).—Potato degeneration (virus) diseases within the State are very prevalent, leaf roll infections often running as high as from 75 to 85 per cent in a crop, lowering yield and increasing the percentage of inferior tubers. The symptoms are described of leaf roll and mosaic, the control of which depends in each case on the production of disease-free seed, for which the maintenance of a specially rogued seed plat is necessary. The disadvantages are pointed out of selection from the barn stock or from the main crop at the time of digging.

Relative susceptibility of various varieties of sorghum to rust, Puccinia purpurea, E. B. Mains (*Phytopathology, 19 (1929), No. 1, p. 104*).—All varieties of the sorgo group tested were found to be more or less susceptible to rust. Of the grain sorghums, 5 strains of feterita were very susceptible, 2 varieties of kafir were very susceptible, 1 moderately so, and 2 moderately resistant. All strains of milo were very resistant, and 2 strains of broomcorn and 2 of hegari were moderately susceptible. One strain of kaoliang and 1 of shallu showed considerable resistance, especially in the field.

A new beet root rot [trans. title], A. Meurs (*Phytopath. Ztschr., 1 (1929), No. 1, pp. 111–116, figs. 2*).—A root-rotting organism of sugar beets and of stock beets is reported as having been isolated by the author in 1927 from decayed beet roots. The organism, as the result of studies indicated, is considered to be a new species of the genus Pythium, and along with a technical description the name *P. mamillatum* is submitted.

Reaction in agronomic strains of timothy to Ustilago striaeformis (Westd.) Niessel, W. H. Davis (*Phytopathology, 19 (1929), No. 1, p. 105*).—Studies of strains of timothy inoculated with spore material received from several States showed that no agronomic strains of timothy were immune, and no physiological strains of the fungus were recognized.

Progress in freeing the virus of mosaic disease of tobacco from accompanying solids, C. G. Vinson and A. W. Petre (*Phytopathology, 19 (1929), No. 1, pp. 107, 108*).—Methods are described for precipitating the virus of mosaic disease of tobacco without destroying it. The virus is said to behave in many ways similar to a chemical substance.

Purification and certain properties of the tomato mosaic virus, P. H. Brewer, H. R. Kraybill, and M. W. Gardner (*Phytopathology, 19 (1929), No. 1, p. 108*).—A method is described for the purification of the mosaic virus of the tomato. The purified virus retained its longevity for a little less than two months at room temperatures. The virus was inactivated by the addition of NaOH to make the suspension more alkaline than pH 7.7, and it became active again at about this point when hydrochloric acid was added.

The separation from mosaic tomato plants of toxins which produce some of the typical mosaic symptoms, H. R. Kraybill, P. H. Brewer, R. W.

SAMPSON, and M. W. GARDNER (*Phytopathology, 19 (1929), No. 1, p. 108*).—Tomato plants inoculated with a combination of the noninfectious filtrate which produced fernleaf symptoms and juice from potato tubers did not produce the streak disease. Plants inoculated with the residue which contained the tomato mosaic principle and juice from potato tubers produced tomato streak disease. Heating the filtrates for 2½ hours at 126° C. did not reduce their activity. The results of the study of the material in the filtrates which produce fernleaf symptoms are said to indicate that it is a nonliving substance of the nature of heat stable toxins, and is probably produced by the mosaic virus.

Bacterial canker of tomato, H. L. BLOOD (*Utah Acad. Sci. Proc., 8 (1930–1931), pp. 55–58, fig. 1; abs. in Utah Sta. Circ. 100 (1932), p. 6*).—A report is given of an investigation of the bacterial disease of tomato due to *Aplanobacter michiganense*, which became serious in Utah in 1927. The effect of the disease on the host is described, as well as the temperature and moisture relations of the parasite. Studies of 53 collections of the parasite failed to show strains of varying pathogenicity. The parasite is carried over winter in the seed and field trash, thus providing primary sources of infection.

The use of clean seed planted in clean soil is considered the most promising measure of control.

Vaseline and the growth of moulds, R. G. TOMKINS (*[Gt. Brit.] Dept. Sci. and Indus. Research, Food Invest. Bd. Rpt. 1930, pp. 68, 69*).—Regarding a method which has been advocated for preventing stalk rot of fruits and vegetables by coating the exposed surface, either by dipping into molten paraffin wax or by smearing it with vaseline, the author records a few facts experimentally determined as to the action of vaseline on the growth of molds.

Vaseline has no antiseptic properties. Though the rate of lateral spread on an agar surface beneath a continuous film of vaseline is not less than that on an uncovered surface, the amount of mycelium produced is much smaller. Mycelium of strong growth can penetrate vaseline in any direction. Spores sown in water on a continuous film of vaseline covering a nutrient medium lacked the nutritional supply necessary to germination. If the spores are supplied with nutrient, growth occurs, but the agar is reached only when the growth is vigorous. No evidence appears that mechanical entanglement of the spores or hyphae in the vaseline may prevent the growth.

The effectiveness of vaseline in preventing stalk rot appears to consist in preventing direct contact with the nutrient surface, also in the reduction of the amounts of mycelium formed whenever germination does occur.

The relation of certain bacteria to the development of roots, A. J. RIKER, W. M. BANFIELD, and G. W. KEITT (*Phytopathology, 19 (1929), No. 1, p. 107*).—Root stimulation and the development of some types of hairy root are said to have followed inoculations with bacteria isolated from overgrowth on apple. Inoculations with known cultures of *Bacterium tumefaciens* resulted in crown galls, and in no case was there shown any stimulation of the roots.

Experiments for control of black spot of apple, W. A. BIRMINGHAM (*Agr. Gaz. N. S. Wales, 41 (1930), No. 8, p. 631*).—Apple black spot control experiments have been conducted for five consecutive seasons in the Penrose and Batlow districts by the Department of Agriculture, New South Wales. At Penrose the best control percentage (78.84, with 24.91 on controls) was obtained by the use of Bordeaux mixture 6–4–50 at spur burst and lime-sulfur 1–35 (26° B.) at the calyx stage. Much better results were obtained at Batlow by the use of Bordeaux mixture 6–4–40 at spur burst, lime-sulfur 1–14 (26° B.) at the pink, and lime-sulfur 1–35 (26° B.) at the calyx stage, this treatment

giving 98.49 per cent of clean fruit as compared with 89.02 per cent on the unsprayed trees.

Trametes hispida a destructive parasite in apple orchards, E. C. SMITH (*Mycologia, 22 (1930), No. 5, pp. 221, 222, pl. 1*).—Though *T. hispida* (familiar in its American form as *T. peckii*) has commonly been regarded as a saprophyte occurring only on deadwood of willows and poplars, it has been frequently found during recent years in eastern Colorado on apple trees, functioning there primarily as a parasite and sometimes proving fatal to the trees.

In the course of somewhat extended observations at Fort Collins, this fungus was observed on a living and otherwise healthy cottonwood and watched from the first appearance of the sporophore to its maturity. Investigations during three years proved that the brackets which were numerous in an apple orchard (most noticeable on dead and dying trunks) represented a final stage, and that the initial stage was on twigs and young branches and easily overlooked. As these died and were pruned away, the mycelium made its way to the base of the branch and to the trunk, the progress being evidenced by the appearance of pilei. The general symptoms were those of a heart rot. About 40 trees had been killed and many weakened, others showing only the initial infection and no other significant fungi appearing in the orchard. It was not doubted that the fungus worked primarily as a parasite, only secondarily as a saprophyte. Similar conditions are said to have been reported for apple orchards near Canon City.

Calcium monosulphide, a substitute for lime-sulphur for summer spraying, R. H. HURT (*Phytopathology, 19 (1929), No. 1, p. 106*).—Experiments conducted for three years on Winesap apples showed that when calcium monosulfide was used as a summer spray scab infection was reduced to 3.19 per cent as compared with 7.4 per cent for lime-sulfur followed by Bordeaux mixture and 75.33 per cent infection on check trees. Calcium monosulfide caused no injury to the trees.

Stemphylium congestum and its relation to decay in apples, G. D. RUEHLE (*Mycologia, 22 (1930), No. 6, pp. 304–309, figs. 2*).—Out of 1,118 isolations from decayed apple fruits which had been kept in cold storage, the author isolated 29 cultures of the type of *S. congestum*, indicated as a new species by Newton (E. S. R., 66, p. 445). Many of these were pure, but some were mixed with Pleospora, Alternaria, Cladosporium, or *Dematium pullulans*. Pure cultures obtained by use of the single-spore isolation method recommended by Keitt (E. S. R., 34, p. 538) and grown on solid media, including 2 per cent dextrose potato agar, Difco corn meal agar, and Difco prune agar, were studied and some are described in the present article.

The characters given by Newton for *S. congestum* are reviewed in connection with those presented by the present author as defining what he offers as a new variety, *S. congestum minor*.

Stemphylium is of little importance on apples when held at cold storage temperatures, though under common storage conditions the rot may be of considerable importance on ripe apples. The lesions produced by Stemphylium may readily be mistaken for those produced by several species or strains of Alternaria, and it is thought that a large percentage of decay in the Pacific Northwest attributed to *Alternaria* spp. is really due to *S. congestum*.

The importance of lenticel infection of apples by Penicillium expansum, K. F. BAKER and F. D. HEALD (*Washington Col. Sta. Bul. 264 (1932), pp. 15, pls. 3*).—In this technical paper the authors give an account of experiments conducted to determine whether or not the blue mold fungus could penetrate the apple otherwise than through wounds of various kinds.

As a result of their studies it was found that blue mold was able to penetrate uninjured apples through lenticels much more commonly than has been reported. It is believed that there are a certain number of lenticels on all apples through which infection can occur, but there are apparently some unknown factors which tend to increase the prevalence of such lenticels in some lots of apples. Lenticel infection is considered to be responsible for a considerable portion of the average annual loss from blue mold decay, and it may be the principal factor involved in lots of fruit showing high percentages of decay at eastern terminal points.

Lenticel infection was observed in eight varieties of apples, and it is believed to occur in all varieties under certain conditions. No differences in varietal susceptibility were observed. The prevalence of lenticel infection is believed to necessitate the modification of the methods of control of blue mold.

Infection in relation to disease in stored apples, A. S. Horne (*[Gt. Brit.] Dept. Sci. and Indus. Research, Food Invest. Bd. Rpt. 1930, pp. 162–172, figs. 2*).—In this work (said to have been carried on with Nitimargi) it was found that the primary infection of apples showing disease during storage was traceable to the orchard from which such apples were obtained, and that the disease-producing fungi varied from one orchard to another. It is thought probable that some recorded cases of freedom from wastage might be due to the absence of infection in the orchard and not to high resistance in the apples. Accordingly, a preliminary study was started of the fungal flora in the air around the orchard trees. This work was carried on in cooperation with the Horticultural Research Station, East Malling, and the Horticultural College, Swanley. The results are tabulated as to locality, situation in the orchard, and occasion. Data are given also as to chemical composition of different parts of the fruit. Changes in resistance were studied, also the experimental induction of changes in resistance to various fungi, with graphs and tabulations of data.

Sour-sap of fruit trees, W. A. Birmingham (*Agr. Gaz. N. S. Wales, 41 (1930), No. 11, p. 799*).—A report credited to Thornell is said to indicate that sour sap was taking heavy toll of cherry trees in the Young district of New South Wales, the trees in the coastal areas which showed no disease the year previously having "developed the disease in an alarming way. ... In some cases 50 per cent of peach trees are severely affected." The cause of the disease, though not sufficiently known, appears to be some physiological disturbance within the tree, possibly related to extreme variations as to moisture. No organism has been isolated.

A promising spray for the control of peach bacterial spot, J. W. Roberts and L. Pierce (*Phytopathology, 19 (1929), No. 1, pp. 106, 107*).—A spray composed of zinc sulfate with hydrated lime and a spreader is said to have reduced the percentage of culled fruit because of bacterial infection in southern Indiana. When used alone the zinc sprays caused no injury, but a caution is given against adding lead arsenate to the spray.

Phony disease of the peach, L. M. Hutchins (*Phytopathology, 19 (1929), No. 1, p. 107*).—A communicable disease of the peach is described, the cause of which is not definitely known. The disease, which has been known for about 50 years, is said to be present in districts that produce 90 per cent of the Georgia peach crop, and it spread to Alabama in 1929. Phony peach trees produce short terminal growth, profuse lateral branching, and deep green foliage. The trees never recover from the disease, neither do they die of it for a number of years. The economic losses are due to a dwarfing effect and to a decrease in the size and number of fruits per tree.

Peach mosaic, a new virus disease, L. M. Hutchins (*Science, 76 (1932), No. 1962, p. 123*).—A preliminary report is given of a disease of peach observed in 1931 in orchards in Brown and Callahan Counties, Tex.

A striking character of the growth was the appearance of the twigs. New growth was abnormal both in number and arrangement of branches, and the internodes were in most cases abnormally short. Inoculation experiments were performed in 1931 on 56 peach nursery trees which were grafted or budded with material from the Texas specimens. No pathological symptoms appeared in 1931, but with the beginning of growth in the early spring of 1932, the symptoms of a virus disease were apparent in the new shoots from all aerial parts of the inoculated trees and in new sucker growth from the roots. The fact that inoculum from either the root or shoot of the suspicious trees in the field communicated the disease is believed to indicate that the infection is systemic.

The author reports that not only is peach mosaic interesting in that it constitutes a new member of the group of peach virus diseases, but it is thought to be the first positive infectious mosaic to be recorded for the peach.

Peach rust and its control, W. P. Duruz (*Calif. Dept. Agr. Mo. Bul., 20 (1931), No. 3, pp. 240–248, figs. 4*).—Reviewing the course of the peach rust outbreak and protective measures, in part previously noted (E. S. R., 64, p. 50), the author reports briefly the findings from 1926 to 1929, inclusive, dealing, respectively, with the nature of the disease, life cycle, susceptibility, field studies, and spraying experiments.

Peach rust is caused by the fungus *Tranzschelia punctata*, which attacks leaves and fruits and overwinters in the twigs. Certain varieties, including particularly the midsummer clingstones, seem to be especially susceptible. Climatic conditions, as rather high temperatures and a saturated atmosphere at sporulation, favor the disease, which tends to be sporadic. Its elimination from an orchard is not usually followed by its early return. Lime-sulfur is effective if timely. "Emergency treatment for the summer infection consists in spraying with a dilute spray of lime-sulfur at the rate of 1 gal. in 100 gal. of water. This treatment has given a very high degree of control when applied at the critical time. The practical spray program for elimination of peach rust from an orchard according to the results of these studies appears to be to advance the usual fall application so that it would be applied during the early fall, from about October 15 to November 1. Lime-sulfur at the rate of 6 or 7 gal. in 100 gal. of spray seems to be slightly superior to other spray materials for the control of peach rust."

Copper sprays versus copper-containing dusting powders: Experiments in the control of grape vine diseases, H. L. Manuel (*Agr. Gaz. N. S. Wales, 41 (1930), No. 8, pp. 619–624, figs. 5*).—Of the three main grape fungus diseases in New South Wales, Oidium, black spot (anthracnose), and downy mildew, the last named is the most frequent and difficult. A black spot trial and an experiment in downy mildew control are outlined. "Up to the present time no treatment has surpassed or equaled in efficiency the use of the long tried out Bordeaux and Burgundy sprays. . . . Growers should not forego the spray because dusting is an easier operation."

A new virus disease of bananas, C. J. Magee (*Agr. Gaz. N. S. Wales, 41 (1930), No. 12, p. 929*).—A supposedly new disease noticed in May, 1929, as affecting banana plantations is briefly described. "The disease takes the form of a severe yellowing and mottling of the younger foliage, followed by a rotting of the heartleaf and central portion of the pseudostem." It is distinct from bunchy top.

Preliminary experimentation has indicated that the disease is infectious, transmissible presumably by the banana aphid (*Pentalonia nigronervosa*). Evidence suggests an infectious chlorosis or mosaic of the virus group. Though as yet confined to a few plantations in one locality, it has in one of these caused serious loss.

A parasitic disease of coffee beans, G. B. WALLACE (*Trop. Agr. [Trinidad], 8 (1931), No. 1, pp. 14–17*).—In this article, following up that previously noted (E. S. R., 67, p. 417), it is stated that although much still remains unknown in regard to this disease, sufficient data are now at hand to base a discussion of its economic importance and control measures.

The history of this disease is not clear, since it is readily confused with another trouble, supposedly nonparasitic. This for distinction is described in parallel in the present article under the name coffee cherry fall, not known to be associated with any fungus. In marked contrast is the disease here again reported, which is associated with spores of a *Nematospora* sp. said to have been found in shriveled coffee beans in December, 1929. It is estimated that a 90 per cent crop loss was due very largely to destruction by this fungus.

The fruit appears healthy externally and grows to normal size, though tiny skin punctures by bugs can be found. The bean itself is spotted and is discolored within. The final effect is dry rot. The associated fungus is said to have been identified by W. Nowell and by S. F. Ashby as *N. coryli*. Experimentation is particularized.

Since the fungus after infection is internal to the coffee cherry pulp, it is inaccessible to sprays. Suggestions are given for control of the carrier, *Antestia lineaticollis*, which is practicable by use of sweetened arsenite of soda.

Monographic studies on the Ustilaginales attacking Andropogon, G. L. I. ZUNDEL (*Mycologia, 22 (1930), No. 3, pp. 125–158*).—This paper reports, with keys and descriptions as occurring on members of the genus Andropogon, 76 species of Ustilaginales. These include Cintractia 1 species, Sorosporium 28, Sphacelotheca 39, Tolyposporella 3, and Ustilago 5 species.

Wilt-resistant asters, L. O. KUNKEL (*Phytopathology, 19 (1929), No. 1, pp. 100, 101*).—Four selections and one commercial strain of China asters are said to have proved very resistant to yellows when grown on highly infested soils.

Progress with the control of aster wilt and yellows, L. R. JONES and R. S. RIKER (*Phytopathology, 19 (1929), No. 1, p. 101*).—Encouraging results are reported with selections of asters for resistance to aster yellows. Growing asters in hopper proof cloth covered inclosures proved practicable under Wisconsin conditions.

Wire-screen fences for the control of aster yellows, L. O. KUNKEL (*Phytopathology, 19 (1929), No. 1, p. 100*).—By surrounding plats with screen wire, 18 meshes to the inch, and roguing out diseased plants, fairly satisfactory control of aster yellows was secured.

A new species of Chaetomella on rose, M. E. SWIFT (*Mycologia, 22 (1930), No. 4, pp. 165–168, fig. 1*).—A rose twig brought to the New York Botanical Garden pathological laboratory in 1929 showed small dark bean-shaped pycnidia. Culturing, development, and study indicated supposedly that the organism was a Chaetomella. This is technically described as a new species and designated as *C. raphigera*. It is said to occur on both Rosa and Rubus, and to be distributed in the States of New York and Virginia.

Development of the asexual fructifications of Chaetomella raphigera and Pezizella lythri, B. O. DODGE (*Mycologia, 22 (1930), No. 4, pp. 169–174, pls. 2*).—Stages, distributions, and synonymy of *P. lythri* have been previously dealt with by the author with Shear (E. S. R., 48, p. 848). In the course of

the former studies, cultures were maintained of a Chaetomella collected from rose, also from wild blackberry. This is said to be the form described as a new species in the above-noted paper by Swift. "Its sexual stage is unknown, and no species of the genus has been connected with a perfect stage. Following the development of the asexual fruit bodies of *P. lythri* and *C. raphigera*, one finds certain striking resemblances as well as marked differences. The reader is referred to the paper previously cited and to a later one by the writer [E. S. R., 49, p. 348], where a full discussion of the development and morphology of the three kinds of fructifications of the former species will be found illustrated." A discussional account is detailed of further studies and of behaviors noted.

Sphaceloma symphoricarpi, A. E. JENKINS (*Mycologia, 22 (1930), No. 3, pp. 106–110, pls. 2*).—This account presents, with discussion, micrographs showing the anthracnose fungus (*S. symphoricarpi*) of Snowberry (*Symphoricarpos albus laevigatus*), as represented by sections of leaves gathered at Grantsville, Md., in August, 1928.

A bacterial parasite of Aloe [trans. title], T. PASSALACQUA (*Riv. Patol. Veg., 19 (1929), No. 5–6, pp. 105–110*).—A diseased condition of *A. plicatilis* was found to be associated with a bacterial organism which when isolated and reinoculated into the plant reproduced the disease. For this organism, supposed to be a new species, the name *Bacterium aloes* is proposed.

An Alternaria and its ascospore form parasitic on Erythrina cristagalli [trans. title], A. AGOSTINI (*Riv. Patol. Veg., 19 (1929), No. 7–8, pp. 165–172, fig. 1*).—Attack by an Alternaria, claimed and described as the new species *A. erythrinae* and as having for its ascospore form *Pleospora erythrinae*, is briefly outlined with discussion.

Cladosporiose in Ficus magnolioides [trans. title], A. AGOSTINI (*Riv. Patol. Veg., 19 (1929), No. 7–8, pp. 155–163, fig. 1*).—This account briefly describes attack by *Cladosporium epiphyllum* on *F. magnolioides* growing in soil which was very poor in organic material, clayey, and difficultly permeable to water.

The fungi and the decay of the American chestnut, Part I, D. V. BAXTER (*Mich. Acad. Sci., Arts, and Letters, Papers, 14 (1930), pp. 259–290, pls. 18, figs. 5*).—This is the result of a partial study of organisms which do or may deteriorate, by decay or by checking, the timber killed during the progress of the chestnut blight.

Listings, tabulations, and discussions are supplied of fungus forms and groupings thereof related, in degrees or rankings partly indicated, to deterioration of the dead chestnut timber. The characteristic or common sapwood fungi and the heartwood fungi are dealt with separately.

Biological studies on willow scab fungus, Fusicladium saliciperdum [trans. title], J. KOCHMAN (*Pam. Państ. Inst. Nauk. Gosp. Wiejsk. Puławach (Mém. Inst. Natl. Polon. Écon. Rurale Puławy), 10 (1929), No. 2, pp. 555–573, pl. 1, figs. 3; Eng. abs., pp. 571–573*).—Presenting the results of observations and studies in 1928–29 of the willow scab fungus (*F. saliciperdum*), observed in Poland as early as 1912, this account describes the results of the infection.

The author observed the perfect stage (*Venturia chlorospora*) in March on infected twigs cut off after having wintered under natural conditions. The conidial stage of *F. saliciperdum* was obtained from ascospores in cultures, but not the ascospore stage from conidial spores. The bodies formed in these cultures are thought to be immature perithecia. Under natural conditions perithecia formed abundantly on the twigs lying on the ground and less abundantly on growing twigs. Formation of perithecia is favored by the moisture under the rotting leaves covering the twigs. Perithecia occur sparsely in the

bark. Species which, with their varieties, are especially susceptible to infection are *Salix alba*, *S. blanda*, and *S. babylonica*. The resistant forms include *S. amygdalina*, *S. purpurea*, and *S. viminalis* and their varieties. The favorable acidity-alkalinity range is from pH 4.4 to 9.0, the optimum being at pH 6.0. The remedial treatment gave the best results from Bordeaux mixture (1 per cent).

Other organisms observed as possible willow parasites include *Physalospora miyabeana* and *Phoma intricans*.

A preliminary study of Coleosporium solidaginis (Schw.) Thüm. in forest plantations in the region of the Lake States, D. V. BAXTER (*Mich. Acad. Sci., Arts, and Letters, Papers, 14 (1930), pp. 245–258, pls. 6*).—In 1929, a rust on needles of red and western yellow pine in plantings of the Saginaw Forest was found to be caused by *C. solidaginis*, known in its aecial stage on red pine as *Peridermium acicolum*. The author has studied this rust on pines of different ages.

The rust does not kill red pine trees, but it causes severe loss by retarding height development in young pines, the lower whorls being most severely affected both in young and in older trees. Different sites also were attacked in different degrees. Though Japanese red and Scotch pines were not infected, young western yellow pine was severely attacked by the rust in the same stand. *Aster* spp. were not infected in the Saginaw Forest. Supposedly *C. solidaginis* does little or no damage to western yellow pine after the trees start to shed their lower needles.

The relationship between the blue-staining fungi Ceratostomella and Graphium, C. T. RUMBOLD (*Mycologia, 22 (1930), No. 4, pp. 175–179*).—The connection appearing between Ceratostomella and Graphium in cultures together suggests the possibility that Graphium may be in a state of evolution, and that even it may have constituted at one time the imperfect stage of Ceratostomella. The cases in which such a connection can be shown appear to be rare in this country, more common in Europe.

The fungus which produces both Ceratostomella and Graphium is regarded by the author as a strain of *C. pilifera*, one of the commonest blue-staining fungi in lumber yards. Though strains of this species vary in minor details, they do not merit specific separation. "A careful study of the fungi grown under cultivation has convinced the writer that there is no line that can be drawn between one strain and another."

ECONOMIC ZOOLOGY—ENTOMOLOGY

Contributions to the knowledge of the reindeer industry of the Yurak-Samoyeds [trans. title], T. LEHTISALO (*Inst. Sammenl. Kulturforsk. [Oslo], Ser. B, No. 16 (1932), pp. [7]+180, pls. 16, fig. 1*).—This account of the reindeer, its raising, use, etc., by the western Samoyeds, includes a list of its diseases and parasites (pp. 36, 37). A brief account of the undomesticated reindeer is included.

Moles and their control in Iowa, J. E. GUTHRIE (*Iowa Sta. Circ. 137 (1932), pp. 7, figs. 6*).—This is a practical account of moles and means for their control.

The parasitic habit in the ducks, a theoretical consideration, H. FRIEDMANN (*U. S. Natl. Mus. Proc., 80 (1932), Art. 18, pp. 7*).—Reference is made to Anatidae that lay their eggs in the nests of others and are in part or entirely parasitic in their reproductive activities.

[Studies of quail in Wisconsin] (*Wisconsin Sta. Bul. 421 (1932), pp. 24–27, fig. 1*).—An account is given of the progress of studies of the food and cover

requirements of quail conducted by P. L. Errington on southern Wisconsin farms in continuation of the work previously noted (E. S. R., 65, p. 449).

[Notes on economic insects and their control] (*Jour. Econ. Ent., 25 (1932), No. 3, pp. 726–732*).—The brief contributions here presented relating to economic insects and means of control (E. S. R., 67, p. 558) are as follows: *Icerya purchasi* in Porto Rico, by W. A. Hoffman (p. 726); A Second Report on the Efficiency of the Air-Blast Type of Sprayer (p. 726) (E. S. R., 64, p. 456) and A Second Report on the Oriental Fruit Moth Infestation in the Georgia Peach Belt (pp. 726, 727) (E. S. R., 64, p. 543), both by O. I. Snapp and J. R. Thomson; The Black Onion Fly, *Tritoxa flexa* (Wiedemann), by E. O. Essig (pp. 727, 728); A Note on the Use of Trichogramma Parasites in Orchards, by A. W. Morrill (p. 728); A New Observed Insect Pest in Hudson Valley Pear Orchards [*Dasyneura pyri* Bouché?], by F. G. Mundinger (pp. 728, 729); Reactions of Sulphuric Acid on Sodium Cyanide, by W. Moore (pp. 729, 730); The Trend in Pest Control Inventions in the United States, by R. C. Roark (pp. 730, 731); and Carbon Disulphide Emulsion to Control Gladiolus Thrips, *Taeniothrips gladioli* M. & S., by E. I. McDaniel (p. 732).

[Contributions on economic entomology] (*Calif. Dept. Agr. Mo. Bul., 21 (1932), No. 2–3, pp. 196–203, figs. 3, pp. 214–220, 225–228, 232*).—The contributions presented include the following: An Attempt to Measure the Hazard from Power Lines during Spraying Operations, by D. B. Mackie and M. L. Jones (pp. 196–203); Observations and Notes on Pear Mite, Generally Known as *Eriophyes pyri*, by H. A. Crane (pp. 214–217); *Spilographa setosa* Doane (p. 217); Red Spider and Other Vine Troubles, by P. F. Wright (pp. 218–220); Grape Leafhopper Control (pp. 225–228); Citrus White Fly Progress (p. 228); and Peach Twig Borer Control (p. 232).

[Contributions on economic entomology] (*Md. Agr. Soc., Farm Bur. Fed., Rpt., 16 (1931), pp. 212–218, 352–366*).—The contributions include the Codling Moth and San Jose Scale—Two Orchard Pests Demanding Close Attention, by E. N. Cory (*pp. 212–218*), *presented before the State Horticultural Society* in January, 1932, and Multiple Matings of Queenbees, by W. J. Nolan (pp. 352–366), in the report of the proceedings of the Maryland State Beekeepers' Association.

[Report of work in entomology], J. A. MUNRO (*North Dakota Sta. Bul. 256 (1932), pp. 36–38, fig. 1*).—The work of the biennium (E. S. R., 63, p. 845) is briefly reported upon, including beekeeping, with a chart showing the variations in temperature and humidity in a bee cellar, and the results of experiments on cricket control.

[Report of work in economic entomology] (*Texas Sta. Rpt. 1931, pp. 32–40, 93–96, 162, 163, 170–172*).—The work reported (E. S. R., 66, p. 49) includes that relating to ingestion of poison by the cotton boll weevil, boll weevil hibernation, and cotton flea hopper hibernation, all by H. J. Reinhard; the cotton flea hopper, by J. C. Gaines, E. W. Dunnam, and S. E. Jones; pink bollworm and cotton bollworm, in cooperation with the U. S. D. A. Bureau of Entomology, the former by [F. A.] Fenton and W. L. Owen, jr., and the latter by F. L. Thomas, Dunnam, R. K. Fletcher, and Gaines; use of sulfur as an insecticide, by Jones; pecan nut case bearer, by S. W. Bilsing; apiary inspection, 1930–1931, by C. E. Heard; work at the plant lice laboratory in control of the turnip aphid and other pests, by J. N. Roney; work in apiculture, including behavior of bees, bee relationships with other insects, and distribution of honey products, by H. B. Parks, and honey plants, queen breeding, bee products, and horsemint for honey production and for oil, by Parks and A. H. Alex; at the Sonora Substation dipping tests with sulfur and rotenone for control of goat lice, in cooperation with the

U. S. D. A. Bureau of Entomology, by O. G. Babcock; and at the Weslaco Substation the California red scale, control of fire ants, and other citrus insects, by S. W. Clark.

[Report of work in economic entomology] (*Wisconsin Sta. Bul. 421 (1932), pp. 78–89, figs. 7*).—The work of the year in economic entomology is referred to (E. S. R., 65, p. 452) under the headings of the splitworm, a tobacco insect new to Wisconsin, studied by R. Bushnell and E. M. Searls; lead arsenate spray controls apple maggots, by C. L. Fluke and T. C. Allen; clean cultivation controls buffalo tree hoppers, by Fluke, Bushnell, and G. Kohn; oil sprays control case bearers on cherries but fail on apples, by Fluke, J. H. Lilly, and M. H. Doner; use of blower reduces the number of onion maggot flies, by Searls, G. C. Broome, and C. M. Gwin; low temperature important for honey storage, by H. F. Wilson and G. E. Marvin; and white grubs found to break away from old habits, by Fluke and K. Koch.

[Contributions on economic insects in the Union of Socialistic Soviet Republics] (*Russ. Ent. Obozr. (Rev. Russe Ent.), 24 (1930), No. 3–4, pp. 135–155, figs. 74, Eng. abs. pp. 146, 147; 166–178, figs. 13, Eng. abs. pp. 177, 178; 179–181, figs. 3; 182–193, figs. 4, Ger. abs. p. 193*).—Among the contributions here presented are the following: Contributions to the Comparative Anatomy of the Genitalia of Elateridae, by Ю. F. Levchuk (J. Levtshuk) (pp. 135–155); On the Habits of *Eurytoma amygdali* End., a Pest of Plums, by E. V. Puzanova-Malysheva (Puzanov-Malyshev) (pp. 166–178); *Euzophera bigella* Zell., Enemy of the Apple in Central Asia, by A. M. Gerasimov (pp. 179–181); and *Harmolita eremita* Portsch. in the Government of Samara with a Review of Other Forms on Grasses, by P. G. Chesnokov (Tshesnokov) (pp. 182–193).

[Contributions on economic entomology in the Union of Socialistic Soviet Republics] (*Izv. Opytn. Sev. Kavkaza (Jour. Agr. Research North Caucasus), No. 20 (1930), pp. 3–156, figs. 34*).—Contributions on economic entomology include the following: On the Ten Years' Work of the Entomological Section of the North Caucasian Regional Agricultural Experiment Station, by V. N. Shchegolev (pp. 3–18, Eng. abs. p. 18); The Spring Grain Aphid (*Toxoptera graminum* Rond.)—Biology, Ecology, and Results of Experiments with Means of Control, by O. S. Moroshkina (pp. 19–78, Eng. abs. pp. 77, 78); The Influence of the Damage Occasioned by Insects in the Field on the Household and Market Value of Small Grain, by V. N. Shchegolev (pp. 79–118, Eng. abs. pp. 117, 118); The Castor Oil Plant Pests in the Northern Caucasus, by B. A. Mamonov (pp. 119–140, Eng. abs. pp. 139, 140); The Arachid Pests in the Northern Caucasus, by V. N. Shchegolev (pp. 141–150, Eng. abs. p. 150); and Concerning the Question of the Influence of Carbon Disulfide and Chloropicrin on the Seeds of Oil Plants, by R. A. Kul'gacheva (Kulgacheva) (pp. 151–156).

The initiation of an insect pest survey in Porto Rico, M. D. Leonard (*Jour. Dept. Agr. Puerto Rico, 16 (1932), No. 1, pp. 59–64*).—In this contribution from the Puerto Rico Insular Experiment Station a brief account is given of the initiation of periodic observations and reports on the more important and injurious insects in Puerto Rico in cooperation with the U. S. D. A. Bureau of Entomology. Faunal studies, both past and present, are referred to, and methods of collecting and recording survey data are described.

Insect enemies of the cotton plant, J. W. Folsom (*U. S. Dept. Agr., Farmers' Bul. 1688 (1932), pp. [1]+29, figs. 34*).—This is a revision of and supersedes Farmers' Bulletin 890 (E. S. R., 38, p. 357.)

Muckland potato spraying experiments, D. O. Wolfenbarger (*Jour. Econ. Ent., 25 (1932), No. 3, pp. 647–649*).—In an experiment conducted by the author with a view to determining the relative value of spraying muck land potatoes

with Bordeaux alone and combined with calcium or lead arsenates, the largest potato yields were obtained from plants sprayed with lead arsenate and Bordeaux mixture. All treatments gave significant increases in yields over unsprayed plants. Wheel injury, while less severe than horse, wheel, and tank injury combined, showed yield decreases below uninjured rows. These decreases in yields due to the spraying operations were more than compensated by the increases obtained as a result of the treatments.

Anthracnose and important insect pests of the mango in the Philippines, with a report on blossom-spraying experiments, M. A. PALO (*Philippine Jour. Sci., 48 (1932), No. 2, pp. 209–235, pls. 8*).—The author has found leafhoppers to be the most important insect enemies of the mango in the Philippines, in severe cases nearly all the inflorescences on a tree being damaged. Two species are involved, the large brown form *Idiocerus niveosparsus* Léth. and the smaller species *I. clypealis* Léth., the latter being the more destructive owing to its great abundance. Injury is also caused by the tip borer *Chlumetia transversa* Walk., which tunnels the panicles and young shoots of mango, causing them to shrivel and dry.

Two destructive defoliators of lodgepole pine in the Yellowstone National Park, H. E. BURKE (*U. S. Dept. Agr. Circ. 224 (1932), pp. 20, figs. 9*).—Accounts are given of the lodgepole needle tier, thought to be (*Eulia*) *Argyrotaenia pinatubana* Kft. of the eastern United States, officially known as the pine tube moth (pp. 3–11), and a small sawfly, *Neodiprion burkei* Middleton, defoliation by which during the years 1921 to 1925 resulted in the killing of large areas of lodgepole pine (*Pinus contorta*) in the upper valley of the Madison River in northwestern Wyoming and southwestern Montana. Practically all the timber on 4,480 acres in the Yellowstone National Park and 7,680 acres in the Madison National Forest is dead, while that on 8,960 acres in the park and 10,880 acres in the forest has been severely defoliated and has suffered considerable loss in the death of many trees, as well as in the retarded growth of many others.

"The larva of the needle tier hatches from an egg laid in a group on a needle in the early summer. It feeds in a tube formed first from a single needle and later from a number of needles webbed together. Most of its feeding is done on the needles of the current year's growth. It becomes full grown the latter part of September, drops to the ground, transforms to a chrysalis, and passes the winter in a slight cocoon spun among the fallen needles. In June or July it transforms to a moth which emerges and flies to the foliage of the lodgepole pine.

"The larva of the sawfly hatches from an egg laid in the edge of a needle in June and feeds first on the outer pulp of the needle, later on the entire needle. Most of its feeding is done on the needles of older growth. It becomes full grown in September, drops to the ground, shortens considerably, spins a tough brown cocoon about itself, and hibernates for one or several winters in this stage. In the spring it pupates in the cocoon and transforms to the sawfly, which emerges and flies to the foliage of the lodgepole pine.

"The trees along the West Yellowstone-Madison Junction Highway in the Yellowstone National Park were kept green during 1924, 1925, 1926, and 1927 by spraying the foliage with a solution of 25 lbs. of powdered lead arsenate, 1 gal. of fish oil, and 400 gal. of water. A large power sprayer was used to apply the spray. About 90 per cent of the infesting caterpillars were killed at a cost of from $6.50 to $10 per acre. Because of the great difficulty of carrying on spraying operations away from roads and highways no attempt was made to control the infestations in the distant areas."

The control of blood-sucking insects in India, S. K. Sen (*Indian Jour. Vet. Sci. and Anim. Husb., 2 (1932), No. 1, pp. 29–40*).—This account includes a list of 89 references to the literature.

Experiments with waxes as possible carriers of insecticides, J. M. Ginsburg (*Jour. Econ. Ent., 25 (1932), No. 3, pp. 599–607*).—The effect on foliage and the toxicity to insects of various solid waxes were studied by the author under greenhouse and orchard conditions at the New Jersey Experiment Stations. The waxes were emulsified with triethanolamine oleate and impregnated with pyrethrum and Derris extracts. The apple aphid, rosy apple aphid, and silkworm were used for testing.

"Emulsions of the following waxes produced no injury to apple and peach foliage: Spermaceti, candelilla, and paraffin in concentrations of 4 per cent or lower of actual wax content. Emulsions containing 1 per cent wax possess appreciable toxicity as contact insecticides and practically no toxicity as internal insecticides. When impregnated with either pyrethrum or Derris extracts, emulsions containing 1 per cent wax possess high toxicity to both sucking and chewing insects."

Experiments with tar distillate sprays, F. Z. Hartzell, P. J. Parrott, and L. R. Streeter (*Jour. Econ. Ent., 25 (1932), No. 3, pp. 607–613*).—A number of brands of tar washes and a homemade emulsion of American creosote oil were investigated at the New York State Experiment Station in regard to their constitution, effects on insects, and toxicity to trees. "The chemical constitution as regards distillation range, acid content, and types of washes are briefly discussed. At the proper dilutions these emulsions seem to be effective against rosy aphid, oyster-shell scale, San Jose scale, and pear psylla; also, they were reasonably efficient against the eye-spotted bud moth. They did not seem to give any control against plum curculio, apple seed chalcid, apple leaf roller, [*Typhlocyba*] *pomaria* leafhopper of the apple, and had only a slight effect upon apple red bugs. While no permanent injury was observed to apple trees, mixtures containing more than 8 per cent of tar oils were generally quite destructive to swelling buds even though they had not reached the silver tip stage. Mixtures containing less than 8 per cent tar oils varied in destructiveness to buds according to dilution and variety of apple, but in no instance was the damage severe as regards the set of fruit. A 4 per cent mixture did not injure the swollen buds of pear or peach in limited tests. Mixtures of tar oils and lubricating oils proved very toxic to apple buds. The practicability of these washes for orchard use are discussed."

The efficiency of tar distillate sprays in controlling San Jose and scurfy scales in 1931, W. S. Hough (*Jour. Econ. Ent., 25 (1932), No. 3, pp. 613–617*).—The results of one season's orchard experiments with five coal-tar distillate sprays or washes for the control of San Jose scale at the Virginia Experiment Station indicate that (1) only the higher concentrations (1–10 and possibly 1–15) may give control somewhat comparable to that obtained with a standard petroleum oil emulsion of 3 per cent oil, and (2) some tar distillates were more efficient than others having about the same boiling range. Tar distillate sprays at concentrations of 1–10 and 1–15 were fairly promising against scurfy scale.

Calcium fluosilicate compound is not calcium fluosilicate, R. H. Carter (*Jour. Econ. Ent., 25 (1932), No. 3, pp. 707–709*).—The author calls attention to the difference between true calcium fluosilicate and calcium fluosilicate compound. The fact is emphasized that entomological results obtained with these materials should be reported separately and should not be compared, as they are quite different in chemical composition. Analyses and compositions of these materials are given.

Grasshopper-control experiments, F. S. Chamberlin (*Jour. Econ. Ent., 25 (1932), No. 3, pp. 722–725*).—In control work in northwestern Florida conducted with a view to protecting tobacco and truck crops from grasshoppers, poisoned bran mash was found to be the most efficient remedy under the conditions there existing. Several series of experiments were carried out during the years 1926–1930 to determine the value of various attrahents in the bait. While the results obtained were inconclusive, they give indications that the attrahents incorporated in the bait were of little, if any, value.

Studies of the onion thrips, F. B. Maughan (*Jour. Econ. Ent., 25 (1932), No. 3, pp. 662–670*).—In tests commenced in Orange County, N. Y., in May, 1930, for control of the onion thrips, all treated plants showed substantial and significant reductions in numbers of thrips over untreated plants, but the differences between treatments, while considerable in some cases, were not of a high degree of significance. Nicotine preparations were most effective in general, with kerosene, pyrethrum products, naphthalene, and copper sprays or dusts giving high degree of control.

A new Taeniothrips on gladiolus, D. Moulton and J. B. Steinweden (*Canad. Ent., 63 (1931), No. 1, pp. 20, 21, fig. 1*).—Under the name *T. gladioli* n. sp., the authors describe a thrips found on gladiolus at Vineland Station, Ontario, and at Cleveland, Ohio.

Taeniothrips gladioli M. & S., a new pest of gladiolus, F. F. Smith and C. A. Weigel (*Jour. Econ. Ent., 25 (1932), No. 2, pp. 312–318, pls. 2*).—An account is given of a species of thrips recently described as new under the name *T. gladioli* (above noted) and its injury to gladiolus.

The economic status of the lygaeids and notes on the life history of Lygaeus hospes Fabr. and Aphanus sordidus Fabr. (Hemiptera, Lygaeidae), W. E. Hoffmann (*Lingnan Sci. Jour., 11 (1932), No. 1, pp. 119–135, pls. 2*).—An account is given of *L. hospes* and *A. sordidus*, including their bionomics, economic status, and description of stages.

Plant bugs as pests of pear and other fruits in the Hudson Valley, F. G. Mundinger and P. J. Chapman (*Jour. Econ. Ent., 25 (1932), No. 3, pp. 655–658, pl. 1*).—In this contribution from the New York State Experiment Station the authors report that late in August the green stinkbug, ***Euschistus euschistoides*** (Voll), and ***E. variolarius*** (P. de B.) were observed in pear orchards throughout the Hudson Valley. They were found to attack several varieties of pears as the fruit was maturing, resulting in serious commercial damage.

Protection of celery from tarnished plant bug injury, L. L. Hill (*Jour. Econ. Ent., 25 (1932), No. 3, pp. 671–678*).—It is pointed out that the tarnished plant bug causes large losses to celery grown on muck land in western New York, the injury resulting both from feeding and oviposition punctures in leaf stalks of the plants. In control experiments commenced in Wayne County in June, 1930, applications of finely ground sulfur as a dust and hydrated lime and ground sulfur as a spray successfully prevented both feeding and oviposition. Other materials gave fair results.

Experiments on the control of Empoasca fabae Harris on young apple trees, T. W. Reed (*Jour. Econ. Ent., 25 (1932), No. 3, pp. 587–591*).—Bordeaux mixture and some contact insecticides were tested at the New York State Experiment Station to determine their efficiency in controlling the nymphs of the potato leafhopper on apple nursery stock. Nicotine sulfate, when mixed with soap or dry mix, was effective in killing the nymphs. Bordeaux mixture, when used at the rate of 2–2–50 or stronger, also resulted in a high degree of control.

Some notes on the control of the apple leafhopper Typhlocyba pomaria McAtee, P. J. Chapman, T. W. Reed, and E. H. Fox (*Jour. Econ. Ent., 25*

(1932), No. 3, pp. 582–586, fig. 1).—This is a report of studies of the leafhopper *T. pomaria* at the New York State Experiment Station.

In New York the leaves of mature apple trees often become stippled and devitalized as a result of feeding by the leafhopper. The species is two brooded and overwinters in the egg stage on apple, in 1931 the first brood hatching out in May and the second brood during the latter half of August. The nymphs are readily killed by nicotine sprays, and since the duration in hatching of either brood was not long in 1931 it appears probable that a single correctly timed treatment may effect a high percentage kill of a brood.

Biology of the potato leafhopper, Empoasca fabae (Harris), and some closely related species of Empoasca, F. W. Poos *(Jour. Econ. Ent., 25 (1932), No. 3, pp. 639–646).*—This is a preliminary summary of studies made of the comparative biology of the potato leafhopper and five closely related species of Empoasca (all described by DeLong) as follows: *E. abrupta, E. bifurcata, E. erigeron, E. recurvata,* and *E. solana.* Evidence is presented which indicates that the potato leafhopper does not overwinter in the north but migrates northward each season.

Mermithid-worm parasitic in leaf-hoppers, with notes on its life history and habits, T. Kaburaki and S. Imamura *(Imp. Acad. [Japan], Proc., 8 (1932), No. 4, pp. 139–141, figs. 6).*—Under the name *Agamermis unka* the author describes a new mermithid worm found parasitic on leafhoppers such as *Nilaparvata oryzae* and *Sogata furcifera,* which at times produced a great deal of injury to the rice plant in Japan.

Additional references to the bean lace bug, M. D. Leonard *(Jour. Dept. Agr. Puerto Rico, 16 (1932), No. 1, pp. 75, 76).*—This contribution from the Puerto Rico Insular Experiment Station supplements the bibliography of 44 titles given in the paper previously noted (E. S. R., 67, p. 289) with six additional notes.

Dormant oil sprays for pear psylla, F. Z. Hartzell *(New York State Sta. Circ. 129 (1932), pp. 8, fig. 1).*—Formulas and directions for insecticidal applications are given.

Spraying and dusting experiments for the control of potato aphids, G. W. Simpson *(Jour. Econ. Ent., 25 (1932), No. 3, pp. 634–639).*—In this contribution from the Maine Experiment Station data regarding the distribution of aphids on plants before and after treatment and the effect of mechanical factors such as machinery and pressure are considered. Preliminary data regarding the effect of Bordeaux on the prevalence of entomophagus fungi and the relative toxicities of various substances used in the field tests are presented.

Potato aphids on Long Island, H. C. Huckett *(New York State Sta. Circ. 128 (1932), pp. 7, fig. 1).*—This is a practical account of plant lice attacking potato on Long Island, including the potato aphid and the green peach aphid.

Aphididae of Formosa, 3–6, R. Takahashi *(Formosa [Taiwan] Govt. Research Inst., Dept. Agr. Rpts. 10 (1924), pp. [1]+121+[12], pls. 10; 16 (1925), pp. [1]+65+[7], pls. 4; 22 (1927), pp. 22+1, pls. 2; 53 (1931), pp. [1]+127, figs. 2).*—In continuation of this series of contributions (E. S. R., 53, p. 157), part 3 presents the results of the author's studies on the nymphs of the Aphididae and also describes certain species from Taiwan (Formosa), as well as others from Japan, 15 of which are new to science. Notes on certain species and keys for the identification of the nymphal instars are also given. Part 4 deals with the natural enemies of Aphididae and also records for the first time 39 species of the family from Taiwan. The author lists 181 species known to occur in Taiwan, of which 142 have been recorded in the earlier reports. In part 5 the author records certain aphids collected in the island of Botel Tabago,

which is located southeast of Taiwan, about 45 miles distant from the most southern portion of the latter, and also describes 12 forms from Taiwan, of which 8 are new to science. Of these, Tetraneura sp. attacks the root of the sugarcane, causing great damage in the eastern part of the island. Part 6 continues the account under the headings of economic aspects of the Formosan Aphididae (pp. 2–5), food plant catalog of the Formosan Aphididae (pp. 6–13), notes on the phylogeny of the Aphididae (pp. 14–18), and classification of the Formosan Aphididae, with some biological notes (pp. 19–104). A bibliography of 18 pages is included.

Additions to the aphid fauna of Formosa (Hemiptera), R. Takahashi (*Philippine Jour. Sci., 48 (1932), No. 1, pp. 69–75, figs. 2*).—This addition to the author's revision above noted includes notes on seven species, of which three are described as new to science.

The relation of hydrocyanic acid gas concentration to the kill of various stages of the blackfly (Aleurocanthus woglumi Ashby), A. F. Camp and R. J. Wilmot (*Jour. Econ. Ent., 25 (1932), No. 3, pp. 476–483, fig. 1*).—The authors report upon experiments conducted in Cuba by the State Plant Board of Florida, using a 20-cu. ft. fumigation box in which the temperature was controlled, on the relation of gas concentration to the kill of the citrus black fly. It was found that at a temperature of from 85 to 90° F., inclusive, 100 per cent control of larvae or pupae was obtained with an exposure of 10 minutes to a concentration of 0.17–0.19 per cent of hydrocyanic acid gas. The adults were completely controlled with a 10-minute exposure to a concentration of 0.03 per cent of hydrocyanic acid gas. The immature stages were exposed in situ on orange, lime, or grapefruit twigs or orange plants.

The relation of hydrocyanic acid gas concentration to the kill of various stages of the green scale (Coccus viridis (Green)), A. F. Camp and R. J. Wilmot (*Jour. Econ. Ent., 25 (1932), No. 3, pp. 483–486*).—In connection with the studies in Cuba above noted, experiments have been conducted in which a 20-cu. ft. fumigation box with controlled temperature was employed to determine the gas concentration necessary to kill the green scale. It was found that, at a temperature of 85–90° F., 1 hour's exposure to concentrations of from 0.04 to 0.05 per cent hydrocyanic acid gas gave 100 per cent control. Concentrations of 0.19 per cent gave 100 per cent control at exposures as low as 5 minutes. The insects were exposed in situ on sapodilla or orange twigs.

Observations on the life-history and control of the fern scale, Hemichionaspis aspidistrae Sign., W. H. R. Werner (*Mich. Acad. Sci., Arts, and Letters, Papers, 13 (1930), pp. 517–541, pls. 3*).—Following a brief introduction, the author considers the injury and dispersal and distribution and host plants of the fern scale, describes its stages, and reports upon its life history and habits and its biological control. The endoparasite *Aspidiotiphagus citrinus* Cwfd. was observed to attack from 6.2 to 75 per cent of the scales examined. The control of the fern scale was found to depend upon several factors, including the presence of the parasite *A. citrinus*, maintenance of a high humidity in the fern house, preparation of a suitable spray, constant trimming off of badly infested fronds, and optimum growing conditions of the fern.

Two new conifer-infesting scale insects from Japan, I. Kuwana (*Philippine Jour. Sci., 48 (1932), No. 1, pp. 51–55, figs. 3*).—*Aspidiotus makii* infesting *Pinus luchuensis* and *A. pseudomeyeri* infesting *Juniperus chinensis* in Japan are described as new.

Some observations on experimental disease in silkworms, E. Hartman and P. K. Wu (*Lingnan Sci. Jour., 11 (1932), No. 1, pp. 69–75*).—The authors find that "pebrine, muscardine, and flacherie diseased cocoons may some-

times be heavier than cocoons from control lots of the same race of silkworms. The quantity of good silk from such pebrine diseased cocoons is less than that from the controls. Apparently pebrine causes an increase in the amount of soluble material in the spun cocoon which may account for the increase in weight. Heavy infestation of silkworms with *Nosema bombycis* before the fourth instar is reached causes, in south China, a very marked decrease in the total weight of dry cocoons produced. It is suggested that certain practices of the Chinese silk producers may account for the fact that pebrine has not become pandemic as it did in France."

The strawberry crown moth, J. Wilcox, K. W. Gray, and D. C. Mote (*Oregon Sta. Bul. 296 (1932), pp. 30, figs. 12*).—This report of studies of the strawberry crown moth, a preliminary account of which has been noted (E. S. R., 63, p. 157), deals at length with the life history and habits of the pest, its natural enemies, and control experiments.

This moth is a serious enemy of the strawberry in western Oregon, through the feeding of the larva on the outside of and tunneling within the crown, and it at times injures the loganberry, blackcap raspberry, and blackberry. The larva remains in the crown of the strawberry over winter and spins its cocoon and pupates in late spring. The eggs are deposited in strawberry patches the latter part of June and July.

The investigations conducted indicate that topping and covering the plant with straw are of value in preventing infestation, although the effect of such treatment on the formation of fruit buds, yield, growth, and other factors in production has not been determined. Flooding by irrigation, which appears to be of value in preventing infestation in California, has not proved satisfactory in control tests under Oregon conditions. As a control measure it is suggested that topping of the strawberry patch be practiced, one-eighth of the patch to be left untopped. In the case of heavy infestation all of the untopped plants may be plowed up and burned or otherwise destroyed in September or October. In light infestations it might be practical to destroy only the heavily infested plants in the untopped rows.

A young patch, adjoining an old planting which is to be removed, should be topped and the old patch left with the tops on throughout the summer and then plowed and destroyed in the fall. The covering of the topped plants with straw also offers possibilities in control and is suggested for trial. The following procedure may be practiced: Most of the patch topped, leaving an occasional row untopped and uncovered, then covering all the topped plants with straw. The topping should be done immediately after harvesting, just before the moths start emerging. By an examination of the pupae the time of emergence can be determined, since the colors of the adults can be seen through the case a day or two before.

The biology of Ephestia elutella Hbn. and the damage it causes to raw tobacco in storehouses, with measures for its control [trans. title], Z. Mokrzecki (*Dośw. Rolnicze (Expt. Agr.), 6 (1930), No. 3, pp. 3–29, figs. 20, Ger. abs. pp. 26–29; abs. in Rev. Appl. Ent., 19 (1931), Ser. A, No. 6, pp. 382, 383*).—The author reports upon studies of *E. elutella*. This has in recent years become an important pest of stored tobacco in Poland, having probably been introduced from Bulgaria, in which latter country the author's investigations in 1921 and 1930 have shown it to be well established and to pass through two generations each year. In Poland, however, there is usually a single generation a year, the adults being on the wing from the end of April to the end of September, although in warm storehouses the moths, larvae, and pupae may occur throughout the year. *Microbracon hebetor* Say, which passes through

two generations each year, has been reared from the larva in Poland. A list is given of the other parasites that have been recorded.

Studies of codling moth flight, H. N. Worthley (*Jour. Econ. Ent., 25 (1932), No. 3, pp. 559–565, fig. 1*).—Distance and direction of dispersal were studied at the Pennsylvania Experiment Station through bait pail catches of marked codling moths. "Data relative to weather conditions affecting the beginning, peak, and end of the daily flight period were gathered by hourly evening examinations of bait pails and weather instruments. Most moths were captured within 500 ft. of the liberation point, and showed a slight tendency to seek shelter from prevailing winds. Evening flight began before sunset, reached its peak the hour following, and decreased with complete darkness. Flight occurred below 60° F. and increased with rising temperature. It was prolonged by moonlight and stopped by rain. The data indicate the possible effect of other factors."

Tests against the overwintering stage of the codling moth, E. N. Cory and P. D. Sanders (*Jour. Econ. Ent., 25 (1932), No. 3, pp. 566–569*).—Tests of 26 combinations, with and without paradichlorobenzene, against hibernacula of the codling moth in 2-in. bands showed that the tar washes and the pine oils at the higher concentrations were quite effective under the conditions of the test. Chemically treated codling moth bands show much promise.

The problem of codling moth control, T. J. Headlee (*Jour. Econ. Ent., 25 (1932), No. 3, pp. 545–554, fig. 1*).—This contribution from the New Jersey Experiment Stations consists of a general summary of the codling moth control problem.

Comparisons between nicotine tannate and arsenate of lead as codling moth poisons, W. Moore (*Jour. Econ. Ent., 25 (1932), No. 3, pp. 554–559*).—In studies at the New Jersey Experiment Stations nicotine tannate was found to kill "the more mature eggs and the young crawling larvae of codling moth by contact. Sprayed apple foliage retains its toxicity to codling moth larvae for at least 21 days. Nicotine tannate appears to be more toxic as a stomach poison to codling moth than arsenate of lead. Success with this insecticide depends on its proper preparation and use, and directions for its preparation are given."

The codling moth and experiments for its control in apple orchards of the high veld during 1930–31, F. W. Pettey (*Union So. Africa Dept. Agr., Sci. Bul. 104 (1931), pp. 30, figs. 9*).—This is a report of control work with the codling moth in the high veld of the Transvaal, Natal, and the Orange Free State, where there are approximately 700,000 bearing apple trees growing in an area from 4,000 to 6,000 ft. above sea level. Details of the work are given in table and chart form.

Time of leaving the fruit by oriental fruit moth larvae, L. R. Cagle (*Jour. Econ. Ent., 25 (1932), No. 3, pp. 678–681, fig. 1*).—In studies of the oriental fruit moth at the Virginia Experiment Station an apparatus was devised for obtaining continuous data on the time of day at which larvae left the fruit. It was found that they practically all left the fruit at night, having been obtained in largest numbers after midnight.

The status of the European corn borer in the United States in 1931, D. J. Caffrey and L. H. Worthley (*Jour. Econ. Ent., 25 (1932), No. 3, pp. 696–706*).—This is a summary of the European corn borer situation in the United States in 1931. Its most serious spread during that year is said to have been in New Jersey, where infestations were found for the first time scattered over about one-half of the State. Other isolated infestations situated at considerable distances from the regulated areas were one in Virginia, one in Kentucky, and two in Wisconsin.

A moth pest of wheat and oats, Ptochostola microphaeila Walker, E. J. WASON (*Agr. Gaz. N. S. Wales, 43 (1932), No. 4, pp. 260–262, fig. 1*).—This is an account of a grass moth, *P. microphaeila*, the larvae of which were a source of injury to wheat and oats in New South Wales in August, September, and November, 1930.

The pink bollworm of cotton in Porto Rico, M. D. LEONARD (*Jour. Dept. Agr. Puerto Rico, 16 (1932), No. 1, pp. 65–73, fig. 1*).—In this contribution from the Puerto Rico Insular Experiment Station the introduction, spread, and present status of the pink bollworm in Puerto Rico are described. In order to portray the somewhat unusual conditions under which the insect is working in the island, the essential climatic and topographic features and the development of sea island cotton growing in Puerto Rico are briefly outlined. Attempts at control are discussed, together with the relation of alternate host plants as a factor in carry-over of the insect from one crop to another.

Observations on the potato tuber moth, G. S. LANGFORD and E. N. CORY (*Jour. Econ. Ent., 25 (1932), No. 3, pp. 625–634*).—This is a report of observations conducted in continuation of earlier studies at the Maryland Experiment Station (E. S. R., 60, p. 841).

It is pointed out that "temperature is an important factor regulating the rate of growth in all stages of the insect. Outbreaks coincide remarkably with certain climatic factors. Hot and dry years seem to be most favorable for development. Every year in which the insect has been abundant the temperatures during the growing season were far in excess of the normal and the rainfall below the normal. This combination of factors was outstanding for the months April to July. Calculations based on the number of day degrees required for development indicate that years in which the tuber moth occurred there was a sufficient accumulation of day degrees to make possible an additional brood of the insect. The intensity of the infestations in a given area appears to vary in proportion to the amount of rainfall."

The damage caused by the potato tuber worm was serious in 1925 and 1930, but slight in 1929.

The squash borer, H. C. HUCKETT (*New York State Sta. Circ. 127 (1932), pp. 7, figs. 4*).—This practical account of the squash borer and means for its control includes a table giving spray formulas and the cost of spray ingredients.

Further suggestions on sugarcane borer control, W. E. HINDS (*Sugar Bul., 10 (1932), No. 18, pp. 2, 3*).—This contribution from the Louisiana Experiment Stations reports upon the status of borer infestation and control through the application of sodium fluosilicate and the colonization of the Trichogramma egg parasite.

Status of cane borer infestation and development, W. E. HINDS (*Sugar Bul., 10 (1932), No. 18, p. 5*).—This contribution from the Louisiana Experiment Stations gives a tabular summary of records concerning the sugarcane borer status from examinations made by station entomologists from May 11 to June 4, 1932.

Sugarcane borer status following freeze, W. E. HINDS (*Sugar Bul., 10 (1932), No. 13, pp. 5–7*).—This contribution from the Louisiana Experiment Stations reports in tabular form upon the status of the sugarcane borer following a temperature of 25° F. on March 10, 1932, at Baton Rouge. It is concluded that the natural mortality among borer stages in hibernation was increased from about 4 per cent before the freeze to 15.4 per cent following the freeze.

Collecting parasites of the sugarcane borer in South America, H. A. JAYNES (*Sugar Bul., 10 (1932), No. 18, pp. 6, 7*).—This is an account of collection and rearing work with parasites of the sugarcane borer in Argentina and

Peru, where several forms have been discovered. Over 637,000 puparia of the dexiid fly *Paratheresia claripalpis* V. d. Wp. and 63,000 females of the wasp *Ipobracon rimac* Wolcott were shipped to the United States during three seasons.

The infestation of the corn ear by Chloridea obsoleta Fab. in regard to time of silking, L. P. DITMAN (*Jour. Econ. Ent., 25 (1932), No. 3, pp. 652–655, fig. 1*).—Observations in Maryland showed that the rate of infestation of the ears was greatest between the second and eighth days after silking on three plantings of corn in 1931. However, when the corn ear worm is exceptionally abundant infestations may be expected before this time, as indicated by the observations of 1930.

On the biology of Euxoa obesa B. (var. scytha Alph.).—Preliminary report [trans. title] Ю. Ю. SKALOV (G. G. SKALOV) (*Gosud. Inst. Tabakoved. [Krasnodar] (State Inst. Tobacco Invest.) Bul. 79 (1931), pp. 12, figs. 9; Eng. abs., p. 12*).—This is an account of one of the most important insect pests of tobacco in the Crimea, a lepidopteran, damage by the larvae of which frequently requires resetting of seedling plants.

The biology of the Microlepidoptera, with particular consideration of their food plants and seasonal occurrence, K. T. SCHÜTZE (*Die Biologie der Kleinschmetterlinge unter Besonderer Berücksichtigung ihrer Nährpflanzen und Erscheinungszeiten. Frankfort on the Main: Internatl. Ent. Ver., 1931, pp. 235, figs. 2*).—This is largely an annotated host plant list of the Microlepidoptera, arranged systematically by orders. The arrangement is by parts of the plants attacked, followed by an index to the plants and to the insects.

The anopheline mosquitoes of China, W. A. RILEY and WU LIANG-YU (*Lingnan Sci. Jour., 11 (1932), No. 2, pp. 175–191, figs. 13*).—An account is given of the anopheline mosquitoes of China, followed by a key for the separation of those reported for China or Indo-China, hints for collectors, and a bibliography of 24 titles.

Charcoal as a diluent for Paris green in the destruction of Anopheles larvae: Larvicide studies, P. F. RUSSELL (*Philippine Jour. Sci., 48 (1932), No. 3 pp. 291–297, pl. 1*).—The author has found that a dust spray of wood charcoal with 1 per cent of Paris green kills over 80 per cent of Anopheles larvae in 4 hours. A spray with a concentration of only 0.2 per cent of Paris green in charcoal killed over 80 per cent in 6 hours. Both of these charcoal sprays killed all the larvae in 24 hours. The experiments indicate that powdered wood charcoal is an excellent diluent for dust sprays intended for mosquito larvicides. Compared with other diluents, charcoal has certain decided advantages, such as the property of floating easily, visibility, etc.

The pear midge and its control, F. G. MUNDINGER and F. Z. HARTZELL (*New York State Sta. Circ. 130 (1932), pp. 7, figs. 3*).—A brief practical account of the pear midge and means for its control.

A contribution to the biology of Simulium (Diptera), Y. F. WU (*Mich. Acad. Sci., Arts, and Letters, Papers, 13 (1930), pp. 543–599*).—A brief introduction is followed by a contribution on the general biology (pp. 544–565) and a report of experimental work with *Simulium* spp. in Michigan (pp. 565–595). For the first time an observational and experimental study was made of the running-water habitat of Simulium. The current rates in the natural habitats were measured and found to be from 0.56 to 2.75 ft. per second, or even higher where larvae were attached in more or less vertical falls. The second factor was studied by the use of filtered lake water in current troughs, and the problem of oxygen supply in both standing and running water. A list of 41 references to the literature is included.

Black flies and other biting flies of the Adirondacks, C. L. Metcalf (*N. Y. State Mus. Bul. 289 (1932), pp. 5–58, figs. 28*).—Following a brief introduction and a discussion of the biting flies (pp. 7–11), the author deals with the black flies (pp. 11–24), punkies (pp. 24–29), the stable fly (pp. 29–34), mosquitoes (pp. 34–36), and deer flies (pp. 36–38). A list of 21 references to the literature is included.

Control of biting flies in the Adirondacks, C. L. Metcalf and W. E. Sanderson (*N. Y. State Mus. Bul. 289 (1932), pp. 59–75, figs. 5*).—The subject is presented by the authors under the headings of general relief from biting flies and special suggestions for control of biting flies, followed by a bibliography of seven titles.

Contribution to the biology of flies injurious to cereals (Chlorops taeniopus Meig., Meromyza saltatrix L., and Lasiosina cinctipes Meig.) [trans. title], S. K. Tsygankov [Tzuigankov] (*Trudy Poltavsk. Selsk. Khoz. Opytn. Sta., No. 90 (1929), pp. 53, figs. 21; abs. in Rev. Appl. Ent., 19 (1931), Ser. A, No. 6, pp. 384, 385*).—A report of studies of the bionomics of *C. taeniopus*, *M. saltatrix*, and *L. cinctipes*, conducted in the Moscow and Poltava Governments, chiefly during 1924–1927.

The Bathurst burr seed fly (Camaromyia bullans Wied.), T. McCarthy (*Agr. Gaz. N. S. Wales, 41 (1930), No. 5, pp. 379–381, figs. 2*).—A brief account is given of the infestation of seeds of *Xanthium spinosum*, a widespread weed in New South Wales, by the fly *C. bullans*, presumed to have been introduced from Chile.

Dispersal of the apple maggot, C. R. Phipps and C. O. Dirks (*Jour. Econ. Ent., 25 (1932), No. 3, pp. 576–582, pl. 1, fig. 1*).—The authors report upon the results obtained and the technic developed in a study of apple maggot dispersal. A total of 1,035 flies were marked and liberated at one release point during the course of the experiment. Of this number, 123 individuals were subsequently recovered at distances varying from 38 to 156 yds. from the liberation point.

The control of the cabbage maggot (Phorbia brassicae Bouché) on radishes, R. B. Friend (*Jour. Econ. Ent., 25 (1932), No. 3, pp. 709–712*).—A comparison made at the Connecticut State Experiment Station between bichloride of mercury and calomel in reference to their efficiency in controlling the cabbage maggot on radishes indicates that a dust consisting of calomel 4 per cent plus gypsum 96 per cent gives as good results as bichloride of mercury (1 oz. in 10 gal. of water) and is cheaper and easier to apply.

The effect of temperature on the growth curves of the Japanese beetle (Popillia japonica Newman), D. Ludwig (*Anat. Rec., 51 (1931), No. 1, Sup., p. 44*).—Weight records were obtained during the growth and metamorphosis of the Japanese beetle at constant temperatures of 20 and 25° C. On the basis of weight and rate of growth at 25° (77° F.), the larvae may be separated into three groups, suggesting physiological varieties. At 20° they may be separated into two groups, one with the resting stage in the third instar and consequently with a relatively short second instar, and the other with the resting stage in the second instar, which therefore was relatively long. Larvae reared at 20° attain a lower maximum weight but require a longer growth period than those reared at 25°, while adults reared from larvae at 20° are smaller than those reared from larvae at 25°. At both temperatures there is a definite sex difference in weight, the female adults averaging from 40 to 50 mg heavier than the males.

Tests with arsenicals on beans for the control of the Mexican bean beetle, H. C. Huckett (*Jour. Econ. Ent., 25 (1932), No. 3, pp. 630–635*).—In

comparative tests made on Long Island of the value of arsenicals when used in spray and dust mixtures for the control of the Mexican bean beetle, magnesium arsenate and basic lead arsenate gave the most reliable results, but for eastern growers these arsenicals are comparatively expensive and are not readily procurable. Tests with calcium arsenate, which is comparatively cheap and easily procurable, showed that this insecticide might be used with comparative safety when combined with a copper-lime dust, Bordeaux mixture, or a heavy hydrated lime spray.

The Mexican bean beetle, H. C. HUCKETT (*New York State Sta. Circ. 125 (1932), pp. 7, figs. 2*).—This is a practical summary of information on control methods for the Mexican bean beetle, which has become a serious pest on Long Island and up the Hudson Valley, and whose presence is well known in western New York.

The Mexican bean beetle in Connecticut, N. TURNER (*Jour. Econ. Ent., 25 (1932), No. 3, pp. 617–620*).—It was found by the Connecticut State Experiment Station, in which State two complete generations appeared during 1931, that the first generation required an average of from 33 to 35 days for the completion of its life cycle and the second generation from 36 to 39 days. Larval development on cowpeas and *Dolichos lablab* was considerably slower than on other host plants. The common varieties of beans were seriously injured. The Broad Windsor bean is the only immune variety grown in Connecticut. Magnesium arsenate as a spray was the most satisfactory control. This material and barium fluosilicate used as dusts were equally effective.

New sprays effective in the control of the locust borer, R. A. ST. GEORGE and J. A. BEAL (*Jour. Econ. Ent., 25 (1932), No. 3, pp. 713–721*).—The authors report upon the results of tests of sprays for the control of the locust borer, particularly on shade trees and in small plantations.

"Attention was paid to the effects of the sprays on the vegetation surrounding the bases of the trees as well as on the stems. Emulsions containing sodium arsenite, pine tar oil and paradichlorobenzene, and orthodichlorobenzene were found to give a high degree of control when applied in the early spring while the young borers were present between the bark and wood. Later applications, after the larvae had penetrated the wood, were not so successful. The cost of application was found to be such as to make it feasible to protect shade trees and possibly trees in small plantations. As a preface to this paper, a brief résumé of literature is given of the work done by other entomologists during the past 25 years to control this borer."

Studies of the striped and spotted cucumber beetles, F. G. BUTCHER (*Jour. Econ. Ent., 25 (1932), No. 3, pp. 658–662*).—In experimental studies at Ithaca, N. Y., of the relative efficiency of copper sprays and dusts both with and without calcium arsenate, the dusted plats in general gave the greatest increase in yields. The addition of the poison substantially increased yields over plats treated with copper-lime mixtures only.

Catalogue and generic synopsis of the Elateridae of China, G. LIU (*Lingnan Sci. Jour., 11 (1932), No. 2, pp. 211–247, fig. 1*).—This catalogue and generic synopsis is accompanied by an index to the tribes and genera and a bibliography of 22 titles.

The potato flea beetle, H. C. HUCKETT (*New York State Sta. Circ. 126 (1932), pp. 5, fig. 1*).—A practical account of the potato flea beetle and means for its control.

The biological cycle of tobacco beetle (Lasioderma serricorne F.) in the conditions of fermentative factories and the influence of temperature variations on the activity of the insect [trans. title], Ю. Ю. SKALOV (G. G.

SKALOV) (*Gosud. Inst. Tabakoved. [Krasnodar] (State. Inst. Tobacco Invest.) Bul. 80 (1931), pp. 16, pl. 1, fig. 1; Eng. abs., p. 16*).—An account of the cigarette beetle, the life cycle of which is considerably shortened by being exposed to the conditions of fermentative factories.

The genus Tachypterellus, with a special study of T. consors cerasi, new subspecies, a cherry pest in Colorado, G. M. LIST (*Colorado Sta. Bul. 385 (1932), pp. 106, figs. 21*).—In the first part of this account the author deals with the curculionid genus Tachypterellus, represented by the species *T.* (*Anthonomus*) *quadrigibbus* (Say), officially known as the apple curculio, and *T. consors* (Dietz), including generic characterization, a study of the genitalia, subspecies and hybridization, a review of the more important related economic literature, and a discussion of the species. A new description is given of *T. quadrigibbus*, and two new subspecies are described, *T. consors cerasi* and *T. quadrigibbus magna*. A detailed account is then given of studies of the new subspecies *T. consors cerasi*, which since it was first noted attacking cultivated sour cherry in 1914 has increased to a point where serious loss has occurred in two counties in the State and for which the name cherry curculio is proposed.

The chokecherry (*Prunus melanocarpa*) is said to have been its native host. A single specimen has been reared from the apple in a breeding cage, but attempts to rear it from the hawthorn have been unsuccessful. It has been observed to feed on and oviposit on the wild plum. From 25 to 40 per cent of the cherry crop may be destroyed in a heavily infested orchard during the blossom period due to feeding of the adults. This feeding cuts stems and destroys the ovaries of many blossoms. In the later feeding on the fruit the adults cut a circular hole large enough for the long snout and feed to as great a depth as the length of the snout will permit. When the cherries are small the cavity may extend into the pit. Some injuries may heal to the extent that only a black speck is detectable, but there is usually a sunken area and in many cases the skin may be tied to the pit, or the fruit made very much one-sided. The number of food punctures per beetle during the season is well over 150.

Eggs are deposited in cavities eaten into the fruit by the female. When the fruits are small, the cavities may extend into the pit. Oviposition commences when the cherries are shedding their husks and reaches the peak when the fruit is about half grown, the number of eggs ranging up to 19 per female. The incubation period of the eggs has varied from 3 to 11 days, the average in 1927 being 6.37 days and in 1929 5.36 days.

The larvae are primarily seed eaters. Only 3.3 per cent have been found to develop outside the pits. The feeding upon the kernel does not materially affect the growth of the cherry. Only a small entrance hole into the pit is made by the larva, but this is enlarged for the exit of the beetle by the mature larva. The larval feeding period varies from 18 to 24 days. Pupation takes place within the pit, the average pupation period being 6.9 days. The adults remain in the pits from one to several days after emergence, then eat their way through the fleshy portion of the fruit. Emergence begins about as the Montmorency cherries are ripening. In 1926 the first beetles left the fruits on July 2, and practically all were out by July 20. On July 15, 1927, 70 per cent had left the fruit and 97 per cent were in the adult stage. The season of 1929 was somewhat later; 27 per cent were yet in the fruit July 24. The newly emerged adults feed ravenously for about a week or ten days upon the ripening cherries, then go into winter quarters. Active beetles are very difficult to find in the orchards after July 25 or August 1. Hibernating beetles have never been taken in the orchards. When confined, the beetles go under grass or other covering on the ground for hibernation.

The pest showed no marked preference for any variety grown in the infested district. Eight species of parasites, two of which were new to science, were reared from the cherry curculio. The parasitism varied from 0 to 78.7 per cent. The average for 1930 was 39.38 per cent and for a 3-year period 22.8 per cent. The species reared were *Eurytoma tylodermatis* Ashm., *Habrocytus piercei* Cwfd., *Entedon tachypterelli* Gahan, *H. lividus* Gahan, *Zatropis incertus* (Ashm.), *Tetrastichus* sp., *Eupelminus saltator* (Lind.), and *Microbracon tachypteri* Mues.

Tests of insecticides were made during four seasons. The results are presented in tabular form and discussed. The best results were secured with arsenate of lead and sodium fluosilicate. The arsenate of lead is to be preferred as it gave better results in the control of the cherry slug and the cherry fruit worm, two other pests common in the orchards. Sprays gave much better results than dusts. Probably the most important time to make a spray is just after the blossoms have fallen. At this time the beetles are cutting stems and eating into the base of many small fruits. An application just after the husks have fallen from the small fruits is of about equal importance. A third application about 7 to 10 days after the second, or when the fruits are about half size, is of value. All three applications should be used in a heavily infested orchard, but in an orchard with a medium to light infestation the first two will suffice. It appears that the three sprays can be used only on such fruit as is to be carefully washed at the factory. It is pointed out that about 50 per cent of the infested fruit can be sorted out by water flotation.

Control recommendations include the destruction of hibernating places in and about the orchards, in some cases the destruction of near-by growths of chokecherries, the spraying with arsenate of lead, and the destruction of infested fruits when these can be picked before the beetles escape.

A list is given of 33 references to the literature.

Studies on control of the apple curculio in the Champlain Valley, O. H. HAMMER (*Jour. Econ. Ent., 25 (1932), No. 3, pp. 569–575, pl. 1*).—This is a report of life history and control studies by the New York State Experiment Station of the apple curculio injury which has recently appeared to a serious extent in a few apple orchards in the eastern part of the State. In experimental plats partial control was secured by the use of properly timed heavy sprays of lead arsenate. The addition of excess lime and fish oil apparently increased the effectiveness of the arsenical treatments.

Further studies of the physical ecology of the alfalfa weevil, Hypera posticus (Gyllenhal), H. L. SWEETMAN (*Jour. Econ. Ent., 25 (1932), No. 3, pp. 681–693, figs. 3*).—This contribution is based upon a project commenced at the Wyoming Experiment Station in 1927 with a view to determining the probabilities of the alfalfa weevil becoming established in the Mississippi Valley States. The insects were maintained in cages in three positions, namely, near the ground, at the tops of the plants, and 3 ft. above the surface of the soil. The responses of all stages of the pest to the various physical factors under field conditions are recorded.

"Daylight temperatures were very favorable for oviposition, while night temperatures generally were too low.... The hatching of the eggs in the natural environment probably is controlled largely by temperature, since the eggs are laid within the stems of the plants. The percentage of the eggs hatching, if exposed, is greatly reduced when the mean relative humidity is below 50 per cent. The incubation periods varied from 9 to 31 days depending upon the temperature, as the night temperatures were often below the minimum effective temperature for incubation of the eggs. Larval development was largely dependent upon temperature, since the food furnished ample

moisture and the young larvae are not exposed until a week or 10 days old. The feeding period required from 23 to 28 days and the pupal period from 10 to 11 days. The minimum temperature during the night was often below the minimum effective temperature for development. Freezing temperatures, which killed the plants, apparently did not injure the larvae."

Haydite as a substitute for wood in the construction of bee hives, L. HASEMAN (*Jour. Econ. Ent., 25 (1932), No. 3, pp. 528–531*).—In search for a more satisfactory substance as a substitute for wood in the construction of beehives, clay tiles, concrete, and a form of concrete in which Haydite is used in place of sand and gravel have all been investigated at the Missouri Experiment Station. "Durability, favorable thermal properties, and cost are important items to consider. Bees housed in hives made of Haydite suffered less from heat last summer than did those in wooden hives, and thus far this winter they seem to be comfortably housed."

The changing flora of the Southwest, H. B. PARKS (*Jour. Econ. Ent., 25 (1932), No. 3, pp. 506–513*).—In this contribution from the Texas Experiment Station an outline is given of the floral areas of the Southwest and distinctive plants, with a review of the present condition which has been brought about by the inroads of agriculture and of overgrazing. It is concluded that the native honey flora has largely disappeared, and that in certain sections sweetclover, alfalfa, and cotton have replaced the original honey flora. It is predicted, however, that in much of the Southwest country considerable land now under cultivation or in overstocked ranges will return to pasture land.

Honey flow from goldenrod in its relation to temperature at Donaldsonville, La., E. OERTEL (*Jour. Econ. Ent., 25 (1932), No. 3, pp. 520–524, figs. 2*).—The author has correlated temperature factors with daily gross gains in weight of one colony of bees at Donaldsonville, the study being based upon the goldenrod honey flow for 1930.

Resistance of hybrid honeybees to a plant poison in California, G. H. VANSELL and F. E. TODD (*Jour. Econ. Ent., 25 (1932), No. 3, pp. 503–506*).—The authors find that "the buckeye plant in California, when used as a source of nectar and pollen by bees, seriously handicaps beekeeping endeavors within its range through its poisoning effect upon the colonies. Since success in resisting this poison, through the use of Carniolan × Italian hybrid stock, had been reported by a beekeeper, Carniolan × Italian and Caucasian × Italian F_1 hybrids, as well as other bees, were tested in 1931. Evidence is in favor of the Carniolan × Italian stock, but even these bees were not entirely satisfactory."

Studies on the changes in nectar concentration produced by the honeybee, Apis mellifera.—Part I, Changes which occur between the flower and the hive, O. W. PARK (*Iowa Sta. Research Bul. 151 (1932), pp. 210–244, figs. 5*).—This is the first of two contributions on the subject, the second of which will deal with the changes in sugar concentrations which occur after the bee has reached the hive. Following a brief review of the literature, the author deals at length with experimental work conducted, many of the details of which are given in tabular form.

The author has found that the honeybee changes the concentration of nectar or sirup only very slightly while en route to the hive. The change is a decrease instead of an increase as has been assumed by many. The extent of decrease varies directly with the concentration of the nectar or sirup. Observed mean decreases varied from 0.02 per cent on a 13 per cent sirup to 1.8 per cent on a 64 per cent sirup. The average decrease for Iowa nectars commonly gathered by the honeybee is about 1 per cent. Carry-over from the previous load is relatively unimportant, as a rule, and may be disregarded when using

an average based upon determinations from 10 or more honey sacs. Changes in concentration of nectar or sirup while in the honey sac are independent of the factor of flight or the absence thereof. For most practical purposes, it may be considered that the honeybee does not appreciably change the concentration of nectar while gathering a load and carrying it to the hive. Should it be desired to make correction for the slight change introduced by the honeybee, this may be done readily by using the regression equation given. Honey sac contents of honeybees captured while gathering nectar from a given plant species give a close approximation to the actual concentration of the nectar as found in those flowers. Highly trustworthy averages were obtained from lots comprising 10 honey sacs, determined individually.

It is concluded that the determination of nectar concentration through the use of honey sac contents opens greatly enlarged possibilities for gaining new knowledge concerning sugar concentrations in the nectars of plants.

The relation of temperature to the deterioration of honey in storage.—A progress report, H. F. Wilson and G. E. Marvin (*Jour. Econ. Ent., 25 (1932), No. 3, pp. 525–528*).—Continued observations by the authors (E. S. R., 65, p. 856) on the relation of temperature to the deterioration of honey in storage show "that severe losses due to deterioration of honey in storage can be prevented. Somewhere below 55° F. honey can be safely stored for indefinite periods. At a range of temperatures somewhere between 55 and 70° optimum conditions are provided at which the majority of honeys may be expected to ferment. At a temperature of 80°, or slightly below, fermentation develops slowly in unripe, and probably not at all in well ripened, honeys."

Data concerning one method of apiary management for use in the California buckeye area, F. E. Todd and G. H. Vansell (*Jour. Econ. Ent., 25 (1932), No. 3, pp. 500–502*).—The authors report that beekeepers in the Great Valley of California experience a severe dearth following spring blossoms. The foothills above this valley afford nectar during spring blooming, but because of poisonous buckeye the colonies can not be safely located there. It is concluded that since the adult bees are not seriously injured by this poison, the removal from the valley colonies of the worker population for use in the storage of buckeye honey is a possibility.

A manual of beekeeping for English-speaking beekeepers, E. B. Wedmore (*New York: Longmans, Green & Co.; London: Edward Arnold & Co., 1932, pp. XXIV+413, pls. [8], figs. [32]*).—This work has been prepared as a guide for those who already have an elementary knowledge of beekeeping. Included in the 17 sections of the work is one on diseases and pests (pp. 379–396).

Studies of the Sirex parasites, R. N. Chrystal (*Oxford: Clarendon Press, 1930, pp. 63, pls. 10, figs. 7*).—This is a report of studies made during the past three years of the biology and postembryonic development of *Ibalia leucospoides* Hochenw., a parasite of the Sirex wood wasp, *S. cyaneus* Fab., conducted in continuation of earlier work (E. S. R., 62, p. 359). It deals with the systematic position of the parasites (pp. 7–10); gives a historical review of the literature on Ibalia (pp. 10–16); and reports upon Ibalia morphology (pp. 16–35), Ibalia biology (pp. 35–55), upon Ibalia and Rhyssa, their interrelations, hyperparasitism, and superparasitism (pp. 55–57), and upon the origin of the parasitic Hymenoptera and the evidence of Ibalia with reference to this (pp. 57–59). A bibliography of 63 references to the literature is included.

The white birch leaf mining sawfly, Phyllotoma nemorata Fallén, in New York, R. D. Glasgow (*Jour. Econ. Ent., 25 (1932), No. 3, pp. 693–695*).—This contribution relates to a sawfly which is severely injuring white birch in the forests of northern New York, northern New England, and eastern

Canada. The pest was first reported in New York in 1930. In 1931 it was found in most of the Adirondack State Park area, and its further spread is considered to be likely to be rapid. It is easily distinguished from another European leaf mining sawfly, *Fenusa pumila* Klug, by the following characteristics: "(1) Leaves mined by *F. pumila* are usually crumpled, those mined by *P. nemorata* usually retain their normal form; (2) *F. pumila* abandons the mined leaf when fully grown and transforms or hibernates in the soil, *P. nemorata* hibernates and transforms within a circular, flat, cocoon-like cell or hibernaculum constructed by the larva within the mined leaf. Where it occurs, *P. nemorata* may easily be found and identified by this hibernaculum from September to June in the mined leaves on the ground."

A preliminary study of the insecticidal efficiency of the pyrethrins, nicotine, and rotenone against the greenhouse red spider mite, H. H. Richardson (*Jour. Econ. Ent., 25 (1932), No. 3, pp. 592–599*).—The author found that "without the addition of some wetting agent the pyrethrins, rotenone, and nicotine, even at high concentrations, have little toxicity to the greenhouse red spider mite [the common red spider]. With the addition of 0.25 per cent potassium oleate soap, rotenone at 0.02 per cent is slightly more toxic than the pyrethrins (0.02 per cent); nicotine is much less toxic than either of these two, approximately 0.06 per cent being necessary to produce a mortality equivalent to that produced by the above concentrations of the other two poisons. With sulfonated castor oil as the wetting agent, the pyrethrins and rotenone at 0.02 per cent are about equivalent in toxicity; nicotine again is much less toxic, about 0.2 per cent being necessary to equal the insecticidal efficiency of the other two at the concentrations given above. Potassium oleate soap at 0.25 per cent and 0.5 per cent is approximately equivalent in toxicity to sulfonated castor oil at 0.5 per cent and 1 per cent, respectively. Soap is more efficient than sulfonated castor oil as a wetting agent for rotenone and the pyrethrins. With nicotine, however, the reverse appears to be true. Nicotine (1–500) makes distinctly alkaline the almost neutral 0.5 per cent sulfonated castor oil, but has a relatively slight effect on the already alkaline soap solution. Alcoholic extracts of the pyrethrins have an acidic effect when added to either sulfonated castor oil or soap emulsion. Acetone solutions of rotenone have very little effect on the pH of either of these wetting agents."

Some observations on tropical rat mites and endemic typhus, W. E. Dove and B. Shelmire (*Jour. Parasitol., 18 (1932), No. 3, pp. 160–168, pls. 5*).—The evidence of transmission of endemic typhus by the tropical rat mite here reported confirms the findings of others on the rat as a reservoir of infection.

ANIMAL PRODUCTION

[Experiments with livestock in North Dakota] (*North Dakota Sta. Bul. 256 (1932), pp. 18, 19, 20, 21, 49, 50, 59, 61, fig. 1*).—This report includes results of comparative steer feeding trials, by F. W. Christensen; breeding ewe lambs, by D. J. Griswold; and studies with swine and poultry.

The swine tests included production of Wiltshire sides, hairless litter records, and a comparison of Trebi and Manchuria barley when fed to pigs, by A. Severson; feeding rye to hogs, by C. H. Plath; and hogging down peas and corn, by V. Sturlaugson. The poultry tests included breeding and selection for egg production, barley v. corn in the ration of laying hens, farm flock demonstration in management and cost and income records, feed cost of growing Bronze turkey poults to six months of age, and the rate of growth of Bronze turkey poults hatched at different dates and from different aged breeding stock and under different management, all by O. A. Barton.

[Experiments with livestock in Texas] (*Texas Sta. Rpt. 1931, pp. 16, 18, 24, 25–31, 34, 35, 37–90, 112, 162*).—The results of tests with cattle include the feeding value of cactus silage and elevator dust, by G. S. Fraps; methods of preparing sorghum roughages and grains for feeding to fattening calves and lambs, by A. K. Mackey and J. M. Jones; comparison of sumac fodder, sumac fodder and alfalfa hay, and cottonseed hulls and alfalfa hay as roughages in rations for fattening yearling steers, by Jones, [F. E.] Keating, [W. H.] Black, and H. P. Smith; feeding baby beeves on ground hegari heads, ground hegari stover, and cottonseed meal, by Jones, Black, R. A. Hall, and Smith; and a study of the grades of feeder steers while on feed and after slaughter, by J. H. Knox.

Sheep and goat tests took up the relation of skinfolds to weight of fleece of Rambouillet sheep, and relation of age of animal to fineness of wool and mohair, both by Jones, B. L. Warwick, and W. H. Dameron; alfalfa hay v. sorghum fodder and limestone for fattening lambs, by Stangel and Jones; a study of the adaptation of the Corriedale sheep to southwest Texas conditions, by Jones, Warwick, Dameron, and [D. A.] Spencer; determining grades and shrinkages of Texas wool and mohair, by S. P. Davis and Jones; studies in growth of mohair, by Mackey, Jones, and [J. I.] Hardy; and spineless cactus for sheep and goats, by Dameron.

Swine tests dealt with the feeding value of grain sorghums, wheat, barley, rye, and oats for swine and method of feeding, by F. Hale.

Poultry work included data on inheritance and improvement of egg production, the calcium-phosphorus requirements in feeds for chicks, and the effect of feed on leg disorders in chicks, by R. M. Sherwood; and the effects of radiations on the domestic fowl, by W. R. Horlacher and Sherwood.

Other studies include the productive value of cottonseed meal, corn stover, and corn silage, by Fraps.

[Feeding and nutrition studies with livestock] (*Wisconsin Sta. Bul. 421 (1932), pp. 104, 105, 106, 107, 108, 112, 113, 119, 123–130, figs. 3*).—This report includes results of a comparison of feeding fattening steers once or twice daily; a test with lambs designed to determine the value of mixing hay with grain to reduce lamb losses; studies with swine to determine safe limits for rock phosphate as a mineral feed, by G. Bohstedt and E. B. Hart, and the fineness of grinding barley and corn for feeding to hogs, by Bohstedt, B. H. Roche, J. M. Fargo, I. W. Rupel, and F. W. Duffee; as well as the following poultry tests:

Safe limits for rock phosphate as a mineral feed, by Bohstedt, Hart, and J. G. Halpin; a study of the value of carotene as a source of vitamin A, by C. A. Baumann and H. Steenbock; method for measuring the content of vitamin D supplements to poultry rations, by Hart, O. L. Kline, and J. A. Keenan; the value of milk sugar as an aid in mineral absorption, by Hart, C. A. Elvehjem, B. Kline, and Keenan; insoluble calcium salts satisfactory for poultry, by Hart and H. J. Deobald; the acid content as an index to the value of cod-liver oil, by J. G. Halpin, C. E. Holmes, Hart, and Keenan; and the value of yeast for improving a good poultry ration, rye an unsatisfactory feed in chick feeding trials, and the cause of slipped tendon, by Halpin and Holmes.

The physiological effect of rations restricted principally or solely to the alfalfa plant.—II, Cystine as a limiting factor in the nutritive value of alfalfa proteins, J. R. Haag (*Jour. Nutrition, 4 (1931), No. 3, pp. 363–370*).—Continuing this study (E. S. R., 62, p. 870) at the Oregon Experiment Station, numerous group and paired feeding experiments with rats were conducted over a period of about three years with a variety of rations and with four distinctly different lots of alfalfa leaves. These experiments were interpreted as demonstrating a deficiency of cystine in the mixed crude proteins of alfalfa.

Rations for live stock, T. B. Wood, rev. by H. E. Woodman ([*Gt. Brit.*] *Min. Agr. and Fisheries Bul. 48* (*1932*), *pp. V+64, figs. 6*).—A simple general method for compounding rations for horses, cattle, sheep, pigs, and poultry is described in this publication.

Approved formulas for special-purpose mixed feeds, F. D. Fuller (*Texas Sta. Circ. 63* (*1932*), *pp. 12*).—Recommendations made in a previous publication (E. S. R., 61, p. 258) have been revised in the light of later information.

Fertility and animal-breeding, F. H. A. Marshall and J. Hammond ([*Gt. Brit.*] *Min. Agr. and Fisheries Bul. 39* (*1932*), *pp. V+50,* [*pls. 6*], *figs.* [*3*]).—In addition to a preliminary physiological description, this publication gives practical information concerning conditions governing the fertility of farm animals.

The ages of breeding cattle and the possibilities of using proven sires, J. L. Lush and M. D. Lacy (*Iowa Sta. Bul. 290* (*1932*), *pp. 33–78, figs. 6*).—Part of the data of this study came from questionnaires sent to the cow tester in each of 99 cow testing associations in the State, and the remaining data came from the latest volumes of the published herdbooks for each of 5 dairy and 3 beef breeds.

More than 85 per cent of the 1,535 bulls in use in Iowa cow testing associations were less than 5 years of age, and nearly 91 per cent were less than 6 years old. About 11.5 per cent of the total were known to have had 1,300 daughters which had freshened, while 6.4 per cent had 616 tested daughters. There were more bulls over 4 years old in herds where there were several registered cows than in herds where there were less than 4 such cows, but the difference was small.

The study of the records of 500 males and 500 females in the herdbooks showed that the sires of males were almost exactly the same age as the sires of females. The dams of beef males were slightly older than the dams of beef females, and a similar tendency was found with the dairy breeds, but here the difference was insignificant. In all breeds the sires were much younger than the dams. Breed differences were shown in several cases.

The average productive life was 3.5 years for dairy cows and 4.3 years for beef cows, which means that 28 per cent of the dairy and 23 per cent of the beef cows are replaced every year. The average productive life of bulls used in registered herds was 2.2 years for dairy bulls and 2.9 years for beef bulls. On this basis 45 per cent of the dairy bulls and 35 per cent of the beef bulls are replaced each year.

Among the more important reasons for the scarcity of aged bulls in service were the following: (1) Aged bulls often become more vicious than young bulls, (2) they are sold to avoid inbreeding, (3) their value for beef is reduced as they grow older, (4) the risk of sterility or death is greater, (5) fashions and blood lines change, and (6) faults in conformation become more apparent.

It is suggested that to increase the effective use of proved sires safety bull pens and paddocks be constructed to eliminate the danger in keeping old bulls and reduce the risk of sterility and death; that bull circles be established to provide service at a low cost; that pedigrees and individuality of the young bulls which are to be given a chance to prove themselves be carefully considered; and that bulls which have been used 2 or 3 years be kept alive until their daughters can be tested.

How old are your bulls and cows and what difference does it make? J. L. Lush and M. D. Lacy (*Iowa Sta. Bul. 290a* (*1932*), *pp. 8, figs. 3*).—This is an abridged edition of the bulletin noted above.

Finishing calves for the market as baby-beeves, two-year-old, and three-year-old steers, E. A. Livesay (*West Virginia Sta. Bul. 251 (1932), pp. 12, fig. 1*).—Concluding this work (E. S. R., 66, p. 560) which has extended over a period of 6 years, it was found that calves fed and marketed as baby beeves have a greater potential value than calves fed and marketed either as 2-year-old or 3-year-old steers. Similarly 2-year-old steers had a greater potential value than 3-year-old steers.

Grass alone did not produce enough finish on 2-year-old steers for slaughter, but a short feeding period (from 56 to 80 days) on a full ration in dry lot put the animals in good slaughter condition. Animals so finished were more desirable than 3-year-old grass-fat steers. The short feeding period was less expensive and produced a more valuable animal than carrying them another year and marketing as grass-fat 3-year-olds.

These trials indicate that West Virginia should produce more good beef calves and market them either as feeder calves or finish them for slaughter at an early age.

Wintering rations for stock calves, R. R. Thalman, H. J. Gramlich, and E. B. Lewis (*Producer, 14 (1932), No. 1, pp. 3–6, figs. 2*).—Feeding tests were conducted at the Nebraska Experiment Station to determine the most economical method of utilizing the corn plant in wintering rations. Calves averaging 365 lbs. per head were divided into 8 lots of 13 or 14 head each and fed for 150 days.

In this work alfalfa proved to be worth approximately the same per ton as corn fodder. A ration of corn silage and 1 lb. of cottonseed cake produced 85.7 per cent as much gain as a full feed of shelled corn and alfalfa hay. One lb. of dry matter in the form of silage produced more gain than a similar amount in the form of ground corn fodder. A ration of ground corn fodder and 1 lb. of cake produced 89.2 per cent as much gain as silage and cake. As a supplement to corn silage, 1 lb. of cottonseed cake produced 14.3 per cent more gain at 10.2 per cent less cost than 2 lbs. of alfalfa and when fed with ground corn fodder produced 8.1 per cent more gain at 3.3 per cent less cost than 1.9 lbs. of alfalfa. A limited feed of shelled corn with a full feed of alfalfa hay was the least satisfactory wintering ration. Ground corn fodder produced approximately 85 per cent as much gain per acre as corn silage when supplemented with either 1 lb. of cake or 2 to 3 lbs. of alfalfa, and the cake was more efficient than the alfalfa. Corn fodder produced from 81.9 to 87.8 per cent as many steer day rations as corn silage when supplemented with either cake or alfalfa.

Adding ground limestone to a ration of silage and cake slightly increased the gains. Cane silage produced less gain per pound of dry matter than corn silage. Finely cut silage was more desirable and less wasteful than coarsely cut silage, and the same was true of fodder. Ground fodder was more palatable than shredded fodder.

The influence of sex on the quality and palatability of beef, M. D. Helser, P. M. Nelson, B. Lowe, B. H. Thomas, and J. W. Woodrow (*Iowa Sta. Leaflet 29 (1932), pp. 8*).—Results of two tests are reported in this publication. In both tests heifer and steer calves were fed a ration of yellow shelled corn, alfalfa hay, linseed meal, and salt. A representative heifer and steer were slaughtered prior to the start of the feeding period and also after 90, 120, 150, and 180 days of feeding. The carcasses were graded, and one-half of each carcass was separated into lean, fat, bone, and tendon. Cooking tests and tenderness and histological examinations of muscle fibers were made on the other half of each carcass.

There was little difference in the percentage of lean, fat, and bone at the start and at the end of 90 days' feeding between steer and heifer carcasses. As feeding progressed the differences were wider. The percentage of lean to fat in both steers and heifers became less as the feeding period lengthened, but the difference increased faster in the heifers. There appeared to be more difference between individual animals than in sex in the quality of meat produced, as judged from the prime rib. A similar improvement occurred in the quality of roasts from both steers and heifers as the feeding period progressed. The better finished roasts ripened more satisfactorily than the other roasts. The variations in the amount and distribution of elastic tissue which influences the toughness of meat seemed to be a characteristic of the individual rather than of sex.

Studies with Hampshire sheep, No. 2, F. S. Hultz and J. A. Gorman (*Wyoming Sta. Bul. 188 (1932), pp. 36, figs. 7*).—Continuing this study (E. S. R., 65, p. 762) similar records with some slight modifications were obtained from all lambs and yearlings winning premiums in the individual classes at the 1931 International Livestock Exposition.

Sheep that were proportionately short bodied ranked higher in placings in contrast to a higher ranking for long-bodied sheep the previous year. The correlation between placings and the measurements and ratios computed from them did not vary greatly. In this year's study the most important measurements appeared to be those dealing with depth and width of chest and with depth and width of rear quarters.

A study of the wool samples showed less variation than in the previous study. The finest shoulder samples measured 0.000803 in. in diameter and the coarsest 0.001157 in. The densest fleeces had 11,932 fibers per square inch and the least dense 6,984. The greatest number of crimps was 12.22 per inch, while the least number was 7.6. No undesirable skin color was found.

The two years' results show that where judges of high ability are serving, the placing of the first two or three individuals in a class may become a matter of nicety in balancing points and in many cases a matter of personal preference. The lower ranking animals are usually markedly deficient in some respect.

Studies in the supplementary feeding of Merino sheep for wool production.—I, The effect of a supplementary ration of blood meal on the growth rate and wool production of Merino sheep on central Queensland pastures, H. R. Marston (*Aust. Council Sci. and Indus. Research Bul. 61 (1932), pp. 31, figs. 10*).—This experiment was conducted at "Meteor Downs," central Queensland, to determine the response in wool growth by Merino sheep when the natural pasture, which during many months is deficient in protein, was supplemented with blood meal containing from 80 to 85 per cent of protein and approximately 2.7 per cent of cystine. The experiment was designed to eliminate as far as possible all variables between the experimental and control groups other than the blood meal.

During the first year, the group receiving the supplement grew better and at shearing time weighed approximately 10 per cent more than the controls. The group receiving the supplement sheared on the average 110.9 oz. of wool, while the controls averaged 80.9 oz. The quality of all fleeces tended toward well grown 64's, but in the control group many poorly grown and tender 70's were represented. The intake of blood meal varied with pasture conditions, reaching a maximum during the winter months of 6 oz. per head per week. Approximately 35 per cent of the cystine from the supplement was recovered in the increased fleece.

The pasture conditions during the second year were more uniform, and the control group reached about the same body weight as the supplemented group at the time of the previous shearing. The average fleece weight of the supplemented group during this year was 130.3 oz. and of the controls 95.6 oz. The quality of the clip as a whole was practically the same as at the previous shearing.

A preliminary comparison of fleeces from B and C type Rambouillets, J. M. JONES, B. L. WARWICK, and S. P. DAVIS (*Natl. Wool Grower, 22 (1932), No. 5, pp. 19, 20, figs. 3*).—Continuing this work (E. S. R., 66, p. 60) at the Texas Experiment Station, the records of over 1,100 fleeces from purebred Rambouillet ewes of ages 1 to 9 years were studied to compare the production of wool by B and C type sheep.

The B type ewes produced approximately 1 lb. more unscoured wool than C type. On a scoured basis the production of wool was practically the same. The staple length of C type fleeces was better than that of the B type, and a larger proportion of the former fleeces could be sold as strictly combing wool. In addition B type fleeces averaged slightly coarser than the C type. The results show that C type ewes carrying dense fleeces produce somewhat better wool than B type ewes and in addition raise more desirable feeder lambs.

Coat and fibre development in some British sheep, A. B. WILDMAN (*Zool. Soc. London, Proc., 1932, II, pp. 257–285, pls. 6, figs. 9*).—A histological study of the development of fibers in sheep was carried out at the University of Leeds. Approximately 50 fetuses of the Leicester, Southdown, Suffolk, Oxford, Dorset, and Scots Blackface breeds and of the Scots Blackface × Wensleydale, Leicester × Cheviot, Southdown × Leicester, Oxford × Suffolk, and Suffolk × Cheviot crosses were examined both microscopically and macroscopically.

Hair follicles in the sheep began to develop before wool follicles. In late fetuses wool fibers were arranged in rows at the skin surface and grew faster than hairs, which showed no special arrangement. The wool follicles were spirally shaped, and the shape of the basal portion of the follicle largely determined the shape of the fiber.

While wool fibers developed in essentially the same manner as fibers of mammals in general, they differed in that the sudoriferous or sweat gland was differentiated earlier than the sebaceous or fat gland. The duct of the sudoriferous gland always opened into the follicle. Before appearing above the skin the tip of the young wool fiber was pushed along a curved passage in the epidermis, which was excavated by cells from the sebaceous gland. During growth of the wool follicle in the Scots Blackface × Wensleydale cross the level of the arrector-muscle insertion changed from the lower half to the upper half of the follicle.

Feeding hogs on Illinois farms, W. E. CARROLL (*Illinois Sta. Circ. 395 (1932), pp. 32, figs. 7*).—The importance of correct feeding of swine, taking into account the value of farm grains, the importance of protein supplements, and mineral and vitamin deficiencies as factors in economic production, is discussed.

Specific recommendations are made for feeding the breeding herd and young pigs and for the use of forage crops.

Protein supplements and pastures for swine, C. I. BRAY, J. B. FRANCIONI, JR., E. M. GREGORY, and M. G. SNELL (*Louisiana Stas. Bul. 223 (1932), pp. 44, figs. 10*).—Part 1 of this publication is devoted to a discussion of results obtained at various experiment stations in feeding tests with pigs. In part 2 are reported the results of swine feeding tests at the Louisiana Stations from 1928–1932.

In these tests it was found that pigs require some animal protein in their rations, but that cheaper and more efficient gains were produced when cottonseed meal and alfalfa meal were mixed with the animal proteins. Shrimp meal was superior to tankage whether fed with or without other supplements. Self-feeding protein supplements saved considerable labor, especially when hogging off crops in the field. Cottonseed meal, while not entirely safe or satisfactory when used as a sole supplement, gave excellent results when combined with tankage or shrimp bran. Alfalfa meal, fine, well cured alfalfa or clover hay, or dehydrated afalfa supplied some necessary elements to dry lot rations, and the dehydrated alfalfa was superior to cottonseed meal in supplementing a ration of corn, rice polish, and shrimp bran for dry lot pigs.

Pastures, particularly the legumes, supply an abundance of cheap protein. Dairy by-products were valuable sources of protein, especially for young pigs. Sweetpotatoes were very deficient in protein and should not be fed without a supplement. Hogging off soybeans at the same time as the sweetpotatoes saved considerable protein but was not as efficient alone as tankage or shrimp meal.

Provendeine for market pigs, E. W. CRAMPTON (*Sci. Agr., 12 (1932), No. 9, pp. 553–565*).—This test was undertaken at Macdonald College to study the effect on rate of gain, incidence of rickets, and general health and vigor of pigs receiving Provendeine, substituted for a part of ground limestone in the regular college protein-mineral supplement. Provendeine is a product advertised to "improve the digestibility of all cereal foods, ensure the assimilation of the mineral salts in the food, prevent rickets, and to make the growth promoting power of vegetable protein equal to that of animal protein." Yorkshire pigs were divided into 10 pairs and fed for a 30-day period immediately following weaning, during which time one pig of each pair received Provendeine. The feeding was then continued through two periods of 60 and 30 days, respectively, to determine any delayed or continued effect of the Provendeine.

It was found that 1 per cent of Provendeine fed to pigs during the 30 days following weaning had no significant effect on the gains in weight or thrift of the animals. During the following 90 days the pigs that had received this supplement showed a tendency toward somewhat larger gains per 100 lbs. of feed than the check lot, but the difference was not statistically significant. It is concluded that with pigs on a properly balanced diet Provendeine is an unnecessary addition to the ration.

Management and feed vs. breeding or heredity, H. S. LINDGREN, A. W. OLIVER, and E. L. POTTER (*Oregon Sta. Bul. 297 (1932), pp. 10–13, figs. 2*).—Tests were conducted to compare big-type and chunky-type pigs and methods of feeding. In the first test a lot of each type of pigs was self-fed the same ration, and two similar lots were given three-fourths the amount of grain consumed by the self-fed pigs until they reached 100 lbs., after which they were self-fed. In a second test one lot of each type was fed a three-fourths ration throughout the feeding period. Each pig was slaughtered at 175 lbs., the carcass was measured, and the wholesale cuts weighed. Body measurements were taken at the start and at the end of the feeding period in the second test.

The results showed that breeding had more to do with the type of market pig than the amount of feed or the management used. There was no change in type of pig from start to finish of the feeding period. Chunky-type pigs yielded from 2 to 3 per cent more back and leaf fat and from 1 to 1.5 per cent more fresh bacon than big-type pigs. The latter type yielded as much as 2 per cent more loin, 0.25 to 2.5 per cent more trimmed shoulder, and 0.25 to 2 per cent more trimmed hams than the chunky-type pigs. As a rule the big-type pigs required less feed per 100 lbs. gain than the chunky-type.

Feather development in Barred Plymouth Rock chicks, A. M. M. Gericke and C. S. Platt (*New Jersey Stas. Bul. 543 (1932), pp. 22, figs. 8*).—In this study Barred Plymouth Rock chicks were divided into 4 lots of 37 birds each. Each lot was fed on all mash rations, the check lot receiving no animal protein, while the other three groups received 5, 10, and 15 per cent, respectively, of a protein supplement made up of equal parts of dried skim milk, meat scrap, and fish meal. The chicks were weighed individually every week for 8 weeks, and a detailed observation was made semiweekly with regard to growth of feathers on each of 10 feather tracts on 10 chicks in each group.

Feather development over the entire body showed a significant increase in direct relation to the amount of protein in the ration, and the development on each feather tract was of the same order. The coefficient of correlation between body weight and feather development when the chicks were 8 weeks old was $+0.8120 \pm 0.0109$. Feather picking was more pronounced in the low protein lots and more prevalent with males than with females. After a feather was picked there was no further development in that feather follicle until the next molting period.

The growth promoting value of yeast added to certain chick rations, F. E. Mussehl and C. W. Ackerson (*Poultry Sci., 10 (1931), No. 7, pp. 369–374, figs. 4*).—At the Nebraska Experiment Station experiments were undertaken to determine the effect of adding yeast to the rations of chicks. In one series of tests 2, 4, and 7 per cent of yeast was added to a basal ration, while in a second series 2 and 5 per cent of yeast was added. In another test 3 per cent of yeast autoclaved at 15 lbs. pressure was added to a standard chick ration and compared with a group receiving yeast not autoclaved.

The addition of yeast to a ration containing at least 75 per cent of cereal products increased the growth rate of chicks. The increase in growth may have been due to the increase in protein level or to the vitamin G content, since the autoclaved yeast was as effective as the unheated yeast. This result precludes the conclusion that the improvement was due to the vitamin B_1 fraction of the yeast. If the improved growth rate was due to the vitamin G content, it was decided that soybean meal must contain liberal amounts of this vitamin.

The effect of an insufficient supply of vitamin D on the growth of the skeleton and internal organs of chickens, E. J. Sheehy and K. Sheil (*Roy. Dublin Soc. Sci. Proc., n. ser., 20 (1932), No. 16, pp. 173–179, pl. 1*).—In this study at the University College, Dublin, Irish Free State, it was found that the antirachitic factor was not only necessary in preventing leg weakness, but its absence resulted in soft bone, crooked breast, reduced size of skeleton and internal organs, and particularly in a serious distortion and reduction in size of the chest cavity and its organs. When the chest cavity has been deformed, it remains undeveloped under subsequent favorable conditions. Chicks which have suffered even from a mild attack of rickets are prevented from reaching their inherited capacity to fatten or produce eggs.

Rice bran, a preventive of perosis (deforming leg weakness) in chickens, H. W. Titus and W. M. Ginn (*Science, 74 (1931), No. 1914, pp. 249, 250*).—In cooperation with the Louisiana Experiment Stations, the U. S. D. A. Bureau of Animal Industry found that perosis of chicks could be partially prevented by (1) adjusting the calcium-phosphorus ratio of the diet to a more suitable value, and (2) by adding from 6 to 10 per cent of rice bran to the ration. When both changes were made simultaneously it was possible to prevent the condition. In the presence of rice bran a calcium-phosphorus ratio of 2.5:1 was found to be effective.

In view of these findings it is held that in addition to vitamin D another accessory food factor or vitamin is necessary for the proper development of the bones of the growing chick.

A type of nutritional leg paralysis affecting chicks, R. M. BETHKE, P. R. RECORD, and D. C. KENNARD (*Poultry Sci., 10 (1931), No. 7, pp. 355–368, fig. 1*).—A type of paralysis affecting the legs and feet of growing chicks was found at the Ohio Experiment Station. This paralysis was similar to that reported by Norris and associates (E. S. R., 63, p. 863). In an effort to learn more concerning the control of the condition, a series of six experiments was undertaken with White Leghorn chicks from the same parent stock and all handled in the same manner.

This paralysis was found to be distinctly different than rickets, hock joint disease, and "crazy chicks" disorder. Wheat middlings carrying the major portion of the germ and wheat germ, while increasing growth, were ineffective in preventing the condition. Attempts to prevent the paralysis by adding various minerals, as well as the ash from the equivalent of 5 per cent alfalfa leaf meal which had proved effective, were negative. Dried skim milk, dried buttermilk, dried whey, a milk concentrate, good quality alfalfa leaf meal, and autoclaved yeast proved effective in preventing the paralysis and in promoting growth.

Cod liver oil in the winter ration of pullets: Results of a three-year study of effects on egg production and the hatching power of the eggs laid, A. W. EDSON (*Minnesota Sta. Bul. 286 (1932), pp. 12, figs. 5*).—A 3-year study dealing with the effect of cod-liver oil on winter egg production was conducted at the West Central Substation, Morris. Each year three pens of birds were fed a scratch and mash ration with or without 1, 2, and 3 per cent of cod-liver oil. Pens were made up of 43 birds each the first year and 80 birds each the second and third years. Cod-liver oil feeding was begun November 1 and continued through April, except the third year when it was fed through May.

The results showed that feeding cod-liver oil to confined pullets during the winter months increased egg production and decreased the cost per dozen eggs. It also increased the hatchability of the eggs. In these tests 2 per cent of cod-liver oil appeared to be the most economical amount to add to the ration from the standpoint of both hatchability and rate of production.

***The efficiency of alfalfa leaf meal and alfalfa meal as substitutes for* green feed in rations for laying hens,** L. N. BERRY (*New Mexico Sta. Bul. 203 (1932), pp. 11, figs. 2*).—This 3-year study was undertaken to determine the relative value of alfalfa meal, alfalfa leaf meal, and green alfalfa for egg production on a year-round basis. In the case of green alfalfa, it was fed either as range or cut green and fed daily. Pens of 25 birds each were fed the same basal ration for 11 months each year. Lot 1 was on green alfalfa range, while the other lots were on bare yards. Lot 1 received the basal ration only, lot 2 had alfalfa leaf meal added, lot 3 alfalfa meal, and lot 4 cut green alfalfa in amounts equal to the average consumption on a dry matter basis in lots 2 and 3.

During the entire laying season the birds in lot 3 gave as satisfactory production as the birds in lot 1, but required more feed to produce 1 doz. eggs. Alfalfa leaf meal was not equal to alfalfa meal. When cut green alfalfa was fed the highest average production was obtained, but the lowest mortality was in the lot on range. Eggs of higher interior quality were produced in bare yards than on range, and this was particularly true during the winter months. Fertility and hatchability were equally satisfactory in all lots.

DAIRY FARMING—DAIRYING

[Experiments with dairy cattle and in dairying in North Dakota] (*North Dakota Sta. Bul. 256 (1932), pp. 22, 23, 32–35, figs. 3*).—The results are summarized of 21 years of a Holstein breeding circuit, by E. J. Thompson; the value of wheat for dairy cows, shelters for dairy cows, and neutralizing cream for butter making, by J. R. Dice.

[Experiments with dairy cattle in Texas], O. C. Copeland (*Texas Sta. Rpt. 1931, pp. 85–87*).—Results of tests on the use of cottonseed meal and hulls as a ration for lactating dairy cows and the feeding value of cottonseed hulls as a roughage for growing dairy heifers are briefly reported.

[Experiments with dairy cattle and in dairying] (*Wisconsin Sta. Bul. 421 (1932), pp. 104–106, 108–112, 113–115, 118, 119, 131–138, 139–141, figs. 3*).—The cattle studies included findings as to safe limits for rock phosphate as a mineral feed, by G. Bohstedt and E. B. Hart; the need of a vitamin D supplement for calves deprived of legume hay, by I. W. Rupel, Bohstedt, and Hart; fineness of grinding barley for dairy cows, by Bohstedt, F. W. Duffee, et al.; a comparison of oat feed and timothy hay for dairy cows, by A. W. Lathrop et al.; and low blood calcium as a cause of milk fever, by L. T. Wilson and Hart.

Under dairying studies are noted tests with sugar for improving the keeping quality of frozen cream, by W. V. Price; effect of minerals and acidity on the quality of cream in storage, by A. J. Morris and H. H. Sommer; increasing the whipping ability of cream by adding milk salts and the effect of acidity on the body and texture of processed cheese, by H. L. Templeton and Sommer; clumping of fat globules in relation to electric charges, by G. C. North and Sommer; and milk salts associated with abnormal thickening of sweetened condensed milk, by V. C. Stebnitz and Sommer.

The feeding of dairy cows, J. Mackintosh (*[Gt. Brit.] Min. Agr. and Fisheries Bul. 42 (1932), pp. VI+40*).—In part 1 of this publication are summarized the results of many investigations on feeding dairy cows. Part 2 shows how this information may be applied in practice to obtain maximum milk production at a minimum cost and at the same time maintain the health of the animals.

The physiological effect of rations restricted principally or solely to the alfalfa plant.—III, The influence of various mineral supplements on the calcium, phosphorus, and nitrogen metabolism of dairy cattle, J. R. Haag, I. R. Jones, and P. M. Brandt (*Jour. Dairy Sci., 15 (1932), No. 1, pp. 23–28*).—Continuing the work noted on page 723, a series of metabolism studies are reported in which the nitrogen, calcium, and phosphorus balances of dairy cattle were determined for 16 5-day periods during which time milk production varied from approximately 10.5 to 15 kg. The rations used consisted of alfalfa hay with and without supplements of disodium phosphate, calcium carbonate, or bone flour. The nitrogen balances were sometimes positive and sometimes negative. The addition of disodium phosphate resulted in slightly positive phosphorus balances, while bone flour gave positive calcium and phosphorus balances and calcium carbonate had no effect on any of the balances. The relation of restricting the ration of dairy cattle principally to alfalfa hay is discussed in this paper.

Calcium and phosphorus metabolism in dairy cows.—III, The adequate ration for high-producing cows and the effect of exercise on calcium, phosphorus, and nitrogen balances, W. A. Turner and A. M. Hartman (*Jour. Nutrition, 1 (1929), No. 5, pp. 445–454, fig. 1*).—Continuing this study (E. S. R.,

58, p. 469) two aged cows producing 28 and 22 kg of milk daily were fed a ration of well cured alfalfa hay, mangel beets, and a grain mixture made up of wheat bran, corn meal, soybean meal, linseed meal, salt, and disodium phosphate. The cows were placed on experiment about 6 weeks after freshening, and during the first 4 weeks received about 95 per cent of their energy requirements according to the Savage standard and during the last 3 weeks about 105 per cent. In this latter part of the test the cows were exercised one-half hour daily.

The cows remained in prevailing negative calcium and phosphorus balances during the 7 weeks of the test. The exercise produced slight and probably insignificant effects on the calcium and phosphorus metabolism but a very marked effect on nitrogen metabolism, changing it from strongly positive to negative balances.

Calcium and phosphorus metabolism in dairy cows.—IV, The assimilation of calcium fed as calcium gluconate, W. A. TURNER, E. A. KANE, W. S. HALE, and H. G. WISEMAN (*Jour. Dairy Sci., 14 (1931), No. 3, pp. 268–275*).—The U. S. D. A. Bureau of Dairy Industry undertook a study to determine the value of calcium gluconate as a source of calcium in the ration of 2 cows in their first lactation period. The metabolism tests were divided into 4 3-week periods. During periods 1 and 3 calcium gluconate was fed at the rate of 5 per cent of the grain ration, while in period 4 an equivalent amount of calcium was fed as limestone.

The metabolism tests showed that calcium gluconate was of little value in improving the calcium and phosphorus of cows producing from 19 to 21 kg. of milk daily, while the results with limestone were inconclusive.

Cotton seed for dairy cows, R. H. LUSH and A. J. GELPI (*Louisiana Stas. Bul. 227 (1932), pp. 11, figs. 2*).—In one test two groups of four Holstein cows each were fed by the reversal method through three periods of 30 days each. A ration of corn, oats, and bran was supplemented with either one-fifth cottonseed meal or one-third cottonseed. In addition a limited amount of soybean hay, silage, and pasture was used. No laxative conditions developed during the test. The cows on meal gained more weight and produced 5.7 per cent more milk than those on seed. These results indicate that under the conditions of the test 100 lbs. of cottonseed meal was equivalent to 206 lbs. of cottonseed.

At the North Louisiana Substation two cows were fed whole cottonseed and legume hay only, while two other cows received the same ration plus pasture and silage. All cows refused the seed after a few days until 20 to 30 per cent of corn meal was added. The decline in production was more rapid on cottonseed rations than on normal rations and apparently more on pasture than in dry lot. Two of the cows produced dead calves and another came in heat approximately 3 months after the last service date. While numbers were few, it was concluded that cottonseed can not replace a ration of corn, hominy, bran, and cottonseed meal when fed with legume hay with or without silage and pasture.

A study of butter made from the cream produced while the cows were fed cottonseed showed in each case an exceptionally hard, tallow-like, brittle, and mealy butter. The butter remained hard even after long exposure to room temperature. Most of these defects of the butter were apparently corrected when the cottonseed ration was supplemented with green feed.

Oat feed as a substitute for roughage, M. H. BERRY (*Maryland Sta. Bul. 332 (1932), pp. 43–48, figs. 2*).—In a series of two trials, oat feed was checked against alfalfa meal pound for pound. In the first test two lots of seven heifers each were fed for 120 days, both lots receiving silage and the same grain mixture. Oat feed and alfalfa meal were fed at the rate of 6 lbs. per

head daily in the respective groups. In the second test two lots of 10 heifers each were fed for 90 days. The lots were fed as in the first trial except that in the oat-feed group 2.35 lbs. of cottonseed meal were added to the ration to make the protein content similar to that of the check ration.

The results showed that oat feed could be substituted pound for pound for hay or roughage when the total protein in the ration was balanced by cottonseed meal. In these tests oat feed was relatively cheap and hay relatively high, making the cost per pound of gain very much in favor of the oat-feed groups.

Functional study of the growth of cattle [trans. title], Y. Hard (*Imp. Zootech. Expt. Sta., Chiba, Japan, Bul. 28 (1932), pp. 43+26, pls. 51; Eng. abs., pp. 41-43*).—This study was undertaken at the Imperial Zootechnical Experiment Station, Chiba, Japan, in an effort to bring out some functional laws and principles governing growth of cattle for use in their improvement.

Accurate measurements of the Japanese breed and Holsteins in Japan, taken over a period of years, were used in this work. The formula of Brody and Ragsdale (E. S. R., 58, p. 767) was transformed into the linear form, log $(A-y)=a+bx$, in which x is the age in months and y the measurements. The values of the unknown constants a and b were determined by the method of least squares.

Using this formula weight growth, linear growth, percentage of mature growth, upper and lower limits of normal growth, and the relation between growth of height at withers and that of body weight and of linear measurements were worked out for the two breeds.

Calf rearing, W. D. D. Jardine (*Kenya Colony Dept. Agr. Bul. 18 (1931), pp. 17*).—This practical publication discusses different methods of raising dairy calves as now practiced in Kenya and describes the underlying principles for raising calves by hand.

A record of the Guernsey herd at the Connecticut Agricultural College, G. C. White and C. Oliver (*Connecticut Storrs Sta. Bul. 175 (1931), pp. 69, figs. 43*).—Based on a systematic set of herd records, this bulletin gives the history and production records of the college Guernsey herd covering a period of 35 years.

The lactose and chloride concentrations of milk produced during irregular intervals between milkings, C. L. Roadhouse and J. L. Henderson (*Jour. Dairy Sci., 15 (1932), No. 1, pp. 1-5, fig. 1*).—In conducting routine analyses of milk for lactose at the California Experiment Station, slight variations in the lactose content of the milk produced at consecutive milkings from individual cows were observed. To obtain further information concerning this difference, two cows each in the second month of lactation and which produced milk of a pleasing taste were fed a ration of alfalfa hay, green alfalfa, and grain mixture. The animals were milked at 12-hour intervals during a 5-day preliminary period, followed by 5 days when the intervals between milkings were 14 and 10 hours and then by 5 days of regular milkings. Records were kept of feed consumption, milk production, and the lactose content and taste of the milk.

It was found that unequal intervals between milkings did not significantly affect the lactose and chloride content of the milk. No change in the taste of the milk was observed.

Studies concerning the handling of milk (*[Gt. Brit.] Min. Agr. and Fisheries Bul. 31 (1931), pp. V+97, [pls. 4], figs. 9*).—This bulletin was published to give information to both producers and consumers of milk on what constitutes clean milk, how it may be produced, and factors adversely affecting milk.

Bacterial counts of milk as affected by some milk-plant practices, C. S. LEETE and L. H. BURGWALD (*U. S. Dept. Agr. Circ. 222 (1932), pp. 12*).—This study was undertaken to determine the effects of the various processes in a pasteurizing system upon the bacterial count of milk. A study was also made of the temperatures used in the pasteurization, bottling, and storage of milk and their relation to bacterial counts. Observations were made in 97 plants situated in 19 cities in 10 States and the District of Columbia. A raw milk sample was collected at the dump tank and an effort made to follow the same batch of milk through the entire plant to the storage room, obtaining samples for bacterial count at different stages during the processing.

It was found that no one process could be neglected if the milk in the final container was to have a bacterial count comparable to that in the pasteurizer. Pasteurizing temperatures of 142 to 146° F. were more effective than temperatures of 140 to 141°. Bacterial counts increased between the pasteurizer and the bottom of the cooler, between the cooler and the bottle, and during 24 hours' storage. Storage temperatures below 40° were preferable to higher temperatures. Bacterial counts showing pin-point colonies tended to decrease during the processing.

Considerable refrigeration was lost during the bottling process, and variations of a marked degree were observed in the temperature at different points in the storage room and also at various times of the day. It is recommended that these losses in refrigeration be controlled.

The public health significance of the growth of thermophilic bacteria in pasteurized milk, P. A. HANSEN (*New York State Sta. Tech. Bul. 196 (1932), pp. 16, figs. 6*).—Sterile skim milk used for experimental feeding was inoculated with 11 cultures of thermophilic bacteria and incubated until the bacteria had acted on the milk for some time. Considerable chemical change took place in the milk in many cases before it was fed to rabbits and guinea pigs.

The animals grew normally in weight, both during and after the feeding tests, and none of the species of bacteria used produced any detectable toxic substances. It appears, therefore, that the presence of thermophilic bacteria in market milk is unimportant from the standpoint of public health. However, large numbers of such bacteria are undesirable in the milk because the trade requires a product as free as possible from all bacteria.

Substantiating results secured under somewhat different conditions with obligate and facultative thermophilic bacteria by R. P. Myers, N. J. Miller, and P. S. Prickett are included.

The effect of pasteurization upon Brucella melitensis var. suis, C. MURRAY, S. H. MCNUTT, and P. PURWIN (*Jour. Dairy Sci., 15 (1932), No. 1, pp. 6–13, fig. 1.*)—Pasteurizing tests using a standard pasteurizing outfit were undertaken to determine whether the porcine strain of the Brucella organism was destroyed during the process. Checks on the efficiency of pasteurization were made with milk inoculated with the bovine strain of the organism.

It was found that a temperature of 62 to 63° C. (143.6 to 145.4° F.) for 3 minutes was sufficient to destroy both types of the organism. This shows that the usual pasteurizing procedure when correctly operated provides an ample factor of safety. However, with the lid of the pasteurizer open a much longer exposure was necessary, and the results were irregular and uncertain. The viable organisms were recovered from the foam of such milk even after 30 minutes. When an ordinary faucet outlet was used on the pasteurizer live organisms were isolated from the outlet after 30 minutes pasteurization, while when the outlet was closed by a stopper on the inside no living organisms remained after 3 minutes exposure.

The solubility of metals in milk.—II, Submerged corrosion tests of various metals in milk, H. T. Gebhardt and H. H. Sommer (*Jour. Dairy Sci., 15 (1932), No. 1, pp. 42–61, figs. 2*).—Continuing this study (E. S. R., 67, p. 67) at the Wisconsin Experiment Station, test pieces of metal 1 by 3 in. but varying slightly in thickness were clamped in a vertical position between the holding arms of a stirring device which revolved at 210 r. p. m. in about 500 c c of milk. Corrosion was determined by weighing the test pieces before and after exposure.

The results showed that the effect of acidity in metal corrosion was characteristic of each metal and for various temperatures. Acidity could not be considered the chief factor in metallic corrosion in milk. Oxygen played an important part in the solution of all metals, and with few exceptions (aluminum and tinned iron) an increase in oxygen content increased metal solution. For copper and copper alloys the temperature of maximum solubility was 70° C., with a marked decrease in solubility on either side of this temperature. Similar results were obtained with nickel, except that the maximum was at 75°. Solubility was low and varied but little with temperature changes in the case of aluminum, Allegheny steel, stainless steel, and tinned copper. With zinc, galvanized iron, and solder-coated copper there was a well-defined tendency to show minimum solubility in the temperature range where copper, copper alloys, and nickel showed maximum solubility. Steam sterilization caused a pronounced increase in the corrosion of zinc and galvanized iron, a slight increase in the case of copper, a slight decrease with brass, and a pronounced decrease with Monel metal and nickel. There were indications that the condition of the metal surface, both from the standpoint of metallographic structure and the presence of protective films, was an important factor in metal solution.

The relative corrosion resistance of the various metals studied are discussed.

The corrosion of metals by milk, C. G. Fink and F. A. Rohrman (*Jour. Dairy Sci., 15 (1932), No. 1, pp. 73–86*).—In tests carried out in one of the pasteurizing plants of New York City samples of milk were taken from 13 different locations of the pasteurizing equipment and analyzed for copper content. In one of the cases strips of various metals were exposed in raw milk for different lengths of time and at controlled temperatures.

It was demonstrated rather conclusively that copper, nickel, and copper and nickel alloys when exposed to milk during pasteurization may cause an increase above 0.7 part per million or a decrease below 0.3 part per million in the copper content of the milk. This change was more pronounced at the higher temperatures. When milk in contact with nickel loses copper this material is precipitated out and nickel goes into solution. Nickel corroded in milk more readily in the absence of oxygen, while copper corroded more readily in its presence.

High chromium nickel iron alloys, "Hyblum" (a high-aluminum nickel-aluminum alloy), chromium-plated copper, and chromium-plated nickel were very resistant to corrosion by milk and for this reason appeared to be satisfactory for dairy equipment.

Sterilization of dairy farm utensils with dry heat, A. C. Dahlberg and J. C. Marquardt (*New York State Sta. Bul. 612 (1932), pp. 16, figs. 2*).—Studies were undertaken to determine whether dry heat "sterilizers" could be used for cleaning dairy equipment. Two dry heat sterilizers were tested, one heated with a gas flame and the other with an electric heating unit.

Results comparable to those obtained with live steam were secured in the dry heat sterilizer generating water vapor from the wet utensils. Maintaining a

temperature of 212° F. for 15 minutes either with steam or dry heat rendered wet utensils equally free from bacterial contamination. It was necessary to maintain a temperature of 200° for at least the last 10 minutes in moist air sterilization by dry heat in order to render the utensils sufficiently free from organisms for practical use. This heat was sufficient to kill all bacteria of the colon-aerogenes group, to dry the utensils, and to reduce contamination to insignificant numbers. The temperature of 200° or above should include either the time required to heat or cool the container. This method of sterilizing appears to be entirely practical, eliminates the need for steam, and dries utensils.

Design of equipment and method for preparing starter for Oregon creameries and cheese factories, F. E. Price, G. H. Wilster, and C. J. Hurd (*Oregon Sta. Bul. 301 (1932), pp. 28, figs. 14*).—This publication was prepared to describe the equipment that had been designed for making mother starter and for maintaining a uniform temperature of milk kept in starter cans during the incubation period. The important points to be observed in the preparation of starter are discussed. This information should be valuable to operators of creameries, cheese factories, and plants making cultured buttermilk for improving and standardizing the method of preparation of high quality starter.

Factors affecting the body and texture of processed cheese, H. L. Templeton and H. H. Sommer (*Jour. Dairy Sci., 15 (1932), No. 1, pp. 29–41, figs. 7*).—Continuing this study (E. S. R., 64, p. 172) at the Wisconsin Experiment Station, comparisons were made to determine the effect of sodium citrate, disodium phosphate, and Rochelle salt individually and in combinations when used as emulsifiers in the manufacture of processed cheese. The main purpose was to study the body and texture of the cheese, but in addition observations were made on the reaction, both pH and titratable acidity, the appearance of the tin foil covering the cheese, color, moisture, and keeping qualities.

The addition of the emulsifying salts improved the body and texture of processed cheese. Sodium citrate gave the most desirable body and texture. When Rochelle salt was used the body was somewhat mealy, tending toward graininess, and showed poor fusion of the warm cheese in the molds. Disodium phosphate gave a soft, soapy product that showed poor fusion.

Graininess was associated with a lack of air cells and was often accompanied by fat separation. The use of 0.5 per cent of salt in processing cheese was sufficient, and when more than 1 per cent was used it produced a noticeable taste and weakened the body. The use of emulsifying agents lessened the body defects produced by salt. Temperature control during processing was necessary. The reaction of cheese was important, but between pH 5.7 and 6.3 differences in body and texture were slight. The addition of 1 per cent of acid or an equivalent amount of alkali weakened the body and produced decided changes in texture. When all other factors were constant, the body of the cheese varied in an inverse ratio with the amount of water incorporated. As the age of the cheese used in blending increased, the body of the processed cheese became weaker. Cheese from 5 to 7 months of age gave satisfactory results in the blending mixture. The greater the proportion of fat in the casein-to-fat ratio of the original cheese, the weaker was the body of the processed cheese.

The properties of milk in relation to the condensing and drying of whole milk, separated milk, and whey, L. A. Allen (*Hannah Dairy Research Inst. Bul. 3 (1932), pp. 159, figs. 10*).—A thorough survey of the scientific and technical aspects in the field of condensed and dried milks was made in order to collect into a concise form a summary of existing knowledge of the subject.

The first three sections of this report deal with the composition of milk, the nature of the individual constituents and their normal range of variation, the colloidal constitution of milk, the effects of heat on its physical properties and bacterial flora, and the general relation of each of these factors to condensing and drying. The four following sections discuss in detail the technical problems involved in the manufacture of sweetened condensed milk, evaporated milk, milk powder, and condensed and dried whey. The final section deals with the uses of the manufactured products and briefly describes their nutritional value.

The digestibility of protein of dried milk manufactured by different processes, A. Miyawaki, K. Kanazawa, and S. Kanda (*Jour. Dairy Sci., 15 (1932), No. 1, pp. 62–70*).—This study was conducted at the Hokkaido Imperial University, Japan, to determine the digestibility of the protein of dried milks made by different processes and to obtain information on the best process of manufacture or manner of handling the products which are intended for human consumption.

A preliminary test showed that there was considerable difference in the peptic digestion of protein in different makes of dried milk, which in some cases were even more digestible than fresh milk. The order of digestibilities from the highest to the lowest was Klim, Kintaro, Lactogen, fresh milk, and Morinaga. As the acidity of the reconstituted milk increased the protein digestibility increased. While the addition of hydrochloric acid improved the peptic digestion in artificial digestion trials, the improvement was more noticeable with low-acid milk. This addition also reduced the differences between the various brands but did not change the order of digestibility. Dried milks that had been freshly opened were more digestible than such milks after exposure to air.

In tests with rats the differences in digestibilities of the different makes were less than in the artificial digestion trials, but the dried milk which showed better protein digestibility with pepsin had a higher digestibility with rats. Apparently the neutralization and the addition of sucrose to milk before drying as in the case of Morinaga dried milk impaired the digestibility.

An economical method of producing acidophilus milk, G. Knaysi (*Jour. Dairy Sci., 15 (1932), No. 1, pp. 71, 72*).—The New York Cornell Experiment Station describes a new method of making acidophilus milk. This method consists of incubating skim milk at from 37 to 40° C. for 2.5 to 3 hours, heating to as near the boiling point as possible for 30 minutes, quick cooling at from 37 to 40°, immediately inoculating with an actively growing culture of *Lactobacillus acidophilus*, and holding at that temperature until coagulation takes place or a few hours longer. This method is more efficient, gives a better product, and requires about half the time necessary to get the skim milk ready for inoculation as the method now in use.

Improving maple ice cream, H. W. Sadler (*Ice Cream Trade Jour., 28 (1932), No. 1, pp. 38, 39*).—This study was undertaken to aid ice cream manufacturers in selecting the best source of pure maple flavor. Maple sugars from four sources were checked against each other, and the one giving the most desirable flavor was used to check against three commercially prepared sirups.

A marked difference was found in the maple sugars used. The most successful were those having a very pronounced flavor, which carried through to the finished product. Maple concentrates produced unnatural flavors and a finished product with a lower score. The use of maple sugar assured a true maple flavor and was slightly more economical than the commercial sirups. It is recommended that certified food colors be used for coloring maple ice cream.

VETERINARY MEDICINE

Handbook of pathogenic microorganisms: Including immunology and epidemiology as well as microbiological diagnosis and technic, edited by W. Kolle, R. Kraus, and P. Uhlenhuth (*Handbuch der Pathogenen Mikroorganismen. Mit Einschluss der Immunitätslehre und Epidemiologie Sowie der Mikrobiologischen Diagnostik und Technik. Jena: Gustav Fischer, 1927–1931, 3. enl. ed., vols. 1, pts. 1–2, pp. XII+[3]+VIII+1334, pls. 9, figs. [32]; 2, pts. 1–2, pp. VIII+VIII+1304, pls. 4, figs. 78; 3, pts. 1–2, pp. VIII+VIII+1826, pls. 3, figs. 139; 4, pts. 1–2, pp. VIII+*[8]*+1364, pls. 22, figs. 115; 5, pts. 1–2, pp. VIII+VIII+1402, pls. 29, figs. 175; 6, pts. 1–2, pp. VIII+VIII+1290, pls. 33, figs. [270]; 7, pts. 1–2, pp. VIII+VIII+1752, pls. 41, figs. 398; 8, pts. 1–2, pp. VIII+VIII+1600, pls. 23, figs. 312; 9, pp. VIII+1066, pls. 22, figs. 284; 10, pp. VIII+800, pls. 6, figs. 444; Index, pp. X+342*).—This is the third edition of a work founded by Kolle and Von Wassermann, of which volumes 1 to 4 of the first edition and volumes 1 and 2 of the second edition have been noted (E. S. R., 16, p. 601; 17, p. 1111; 30, p. 379; 32, p. 78).

The work, which is contributed to by a large corps of specialists, first takes up the nature, transmission, and diagnosis of, immunity to, and prophylaxis, therapeutics, epidemiology, etc., of the infectious and parasitic diseases, with accounts on the general morphology and biology of pathogenic microorganisms, morphology and serology of the normal blood of the domestic and laboratory animals, disinfection and sterilization, etc. The serum therapy of poisoning by animal venoms, phytotoxins, etc., are considered in volume 3. Commencing with and continuing from volume 3, page 1041, to volume 9, page 526, the infectious and parasitic diseases of man and the domestic animals, the nature of the causative organisms, etc., are dealth with at length. A brief account is then given of the bacterial, fungus and related diseases of plants (vol. 9, pp. 527–566). The work concludes with contributions on methods and technic. The accounts are accompanied by references to the literature. An index and a table of contents are given in a supplementary volume.

The principles of bacteriology and immunity, I, II, W. W. C. Topley and G. S. Wilson (*London: Edward Arnold & Co., 1929, vols. 1, pp. XVI+587+XVI, figs. 171; 2, pp. VIII+589–1300+XX, figs. 71*).—Volume 1 of this work consists of two parts, part 1 (pp. 1–233) being devoted to general bacteriology and part 2 (pp. 235–587) to systematic bacteriology. Part 3 in volume 2 deals with infection and resistance (pp. 589–786) and part 4 with the application of bacteriology to medicine and hygiene (pp. 787–1300).

Physiology of bacteria, O. Rahn (*Philadelphia: P. Blakiston's Son & Co., 1932, pp. XIV+438, figs. 42*).—Following a brief introduction, the several parts of this work deal, respectively, with endogenous catabolism (pp. 9–21), energy supply of the cell (pp. 22–161), growth (pp. 162–269), and mechanism of death (pp. 270–394). The size of microorganisms, multiplication of bacteria, and the fermenting capacity of the cell are taken up in an appendix (pp. 395–408). Author and subject indexes are included.

Disease, its cause and prevention, J. E. Greaves (*Sci. Mo., 33 (1931), No. 5 pp. 428–433; abs. in Utah Sta. Circ. 100 (1932), p. 9*).—A practical summary.

Three poisonous vetches, O. A. Beath, J. H. Draize, and H. F. Eppson (*Wyoming Sta. Bul. 189 (1932), pp. 23, figs. 11*).—This contribution reports upon the general results of chemical and physiological experiments with three species of vetches that are positively known to be troublesome, namely, the two-grooved milk vetch (*Astragalus bisulcatus*), a preliminary account of which by Beath and Lehnert has been noted (E. S. R., 37, p. 780), a second species, *A. scobinatulus*, and timber milk vetch (*A. campestris*).

The two-grooved milk vetch, the fatalities from which are confined mainly to sheep, is particularly troublesome some years in late summer and fall. Death occurs quickly where an appreciable amount is eaten at one time; chronic types of the disease only occasionally occur. Although unquestionably poisonous to cattle, the extent of losses from it remains to be determined. Supervised grazing and grubbing out of the plant are the only suggestions offered for its control.

The losses caused by the timber milk vetch in certain areas in the southern and southwestern parts of the State have compelled livestock herders to abandon badly infested ranges. In August, 1930, a small band of mixed sheep was held in an inclosure on timber vetch for a period of 10 days, during which time they were not trailed or unduly excited, without any bad effects. The chronic form of poisoning is more prevalent in the State than the acute form. Special care for the poisoned stock is the only recommendation that the authors can make at the present time.

A. scobinatulus occurs abundantly in the southern part of the State.

The physiological studies show *A. bisulcatus* to be nearly twice as toxic when past seeding as when in full bloom, and that *A. campestris* in full bloom is nearly as toxic as *A. bisulcatus* in the stage past seeding. Timber milk vetch acts more like a true nerve depressant than the two-grooved milk vetch. The latter when past seeding causes severe injury to the gastrointestinal tract. Acute deaths with all three specimens are caused by failure of respiration. The severe congestion in the lungs, etc., together with the weak dilated hearts, suggests that a failing circulation or secondary effects due to such a weak, sluggish circulation are mainly responsible for chronic deaths.

The data on the toxicity of the various stages of growth of *A. scobinatulus* are said to be too incomplete to make comparisons with the corresponding stages of *A. bisulcatus* and *A. campestris*.

The efficiency of certain germicides in the preservation of biologic products, W. G. Malcolm (*Jour. Bact., 22 (1931), No. 6, pp. 403–425, figs. 4*).—In the study of germicides to be employed in the preservation of biologic products, Yatren and hexylresorcinol (1:1,000) were found insufficiently effective to permit their use for such purpose. Of the biologic preservatives studied mercurophen appears to be the most satisfactory, with metaphen as the second choice, both being superior to phenol and trikresol. The higher germicidal power of these two mercury compounds causes them to be relatively less toxic than phenol and trikresol when used as biologic preservatives, and permits a greater margin of safety in their use. Neither metaphen nor mercurophen at their germicidal strength precipitates proteins, while both phenol and trikresol have this action.

It is pointed out that the use of phenol and trikresol in germicidal concentrations in the spinal canal is dangerous because of action upon the respiratory and vasomotor centers. Serums preserved with metaphen and mercurophen, on the other hand, when injected into the spinal canal had no effect upon the blood pressure or respiratory movements.

[Report of work in veterinary medicine] (*North Dakota Sta. Bul. 256 (1932), pp. 49, 53, 54*).—This report of work relating to animal pathology (E. S. R., 63, p. 870) includes references to control of diseases and parasites of poultry, by O. A. Barton, and to sweetclover disease, avian tuberculosis, kamala for tapeworms in turkeys, infectious laryngotracheitis of young chicks, and pregnancy disease of sheep, by L. M. Roderick.

[Report of work in animal pathology] (*Texas Sta. Rpt. 1931, pp. 9–14, 16, 85, 156–161*).—Brief references are made to work of the year (E. S. R., 66,

p. 68) with loin disease of cattle, infectious bovine abortion, swellhead in sheep and goats, anaplasmosis, and poisonous plant investigations, by H. Schmidt; sore mouth in sheep and goats, by Schmidt and W. T. Hardy; loco weed (*Astragalus earlei*) poisoning, by F. P. Mathews; loco poisoning, by G. S. Fraps and E. C. Carlyle; and plants harmful to livestock, particularly bitterweed (*Actinea odorata*), by V. L. Cory. Work at the Sonora Substation, also reported upon, relates to sore mouth, swellhead of sheep and goats, stomach worms, and icterohemoglobinuria in sheep, by Hardy, and bitterweed poisoning of sheep, by Hardy, W. H. Dameron, and Cory.

[Report of work in comparative pathology] (*Wisconsin Sta. Bul. 421 (1932), pp. 97–103, fig. 1*).—The work of the year (E. S. R., 65, p. 470) not previously reported is briefly summarized on no-lesion reactors in tuberculosis, studied by E. G. Hastings, J. McCarter, and B. A. Beach; *Streptococcus epidemicus* infection in cows, studied by F. B. Hadley et al.; and value of common lye as a barn disinfectant, studied by E. C. McCulloch, Hastings, and Hadley.

Actinomycosis and actinobacillosis, J. McFadyean (*Jour. Compar. Path. and Ther., 45 (1932), No. 2, pp. 93–105, fig. 1*).—The author finds that "actinomycosis and actinobacillosis are etiologically distinct diseases, and they should no longer be united under a common name. Actinomycosis is the disease caused by the *Actinomyces bovis* which was first cultivated by Wolff and Israel. It includes practically all the cases hitherto so named in man and a minority of the cases in cattle in which the bones of the head are affected. Actinobacillosis is the disease caused by the *Actinobacillus lignieresi*, which was first cultivated and accurately described by Lignières and Spitz [E. S. R., 14, p. 498]. In cattle it apparently includes all cases of the so-called wooden tongue in all parts of the world and an uncertain proportion of cases involving other parts of the body, including the bones of the head."

The fate of anthrax bacilli in ticks from an anthrax carcass, G. Martinaglia (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 5, pp. 805, 806, fig. 1*).—Observations made by the author at Johannesburg, South Africa, indicate that the anthrax organism is still viable at least 24 hours after ingestion by the blue tick (*Boophilus decoloratus*) and that it is then gradually rendered sterile.

Blackleg immunization, J. P. Scott (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 6, pp. 848–862*).—In this contribution from the Kansas Experiment Station it is pointed out that while *Clostridium chauvei* is primarily the cause of blackleg other anaerobes may be associated with it, the losses occurring in some vaccinated herds being explained by their presence.

"Blackleg aggressin produced by the destruction of valuable animals should be discontinued, as more efficient products are now available. Blackleg bacterin produced from 10-day cultures of blackleg cultures is a highly efficient product. The potency of this product is apparently due to the soluble products contained in the culture and is not due to the presence of the dead bacteria. The potency of blackleg filtrate is due to the presence of a substance called aggressin, which is developed in the culture medium during the active growth of the organism. Potency tests for blackleg products on guinea pigs and calves are described. It is suggested that the aggressive action tests are more valuable than calf potency tests.

"It is shown that formaldehyde has a specific action on the aggressive substance in blackleg filtrate, bacterin, and aggressin. Formolized products have a higher potency than the corresponding nonformolized products. Formolized bacterin and filtrates produce sera in horses of as high a titer as whole-cul-

ture injections. A mixed or polyvalent formolized bacterin is suggested on theoretical grounds.

"The five points of differentiation of *C. chauvei* from other anaerobes are discussed, and the different fermentation powers of this organism are pointed out."

A list of 41 references to the literature is included.

Epidemiological and experimental studies of boutonneuse fever conducted at the Pasteur Institute of Athens [trans. title], G. Blanc and J. Caminopetros (*Arch. Inst. Pasteur Tunis, 20 (1932), No. 4, pp. 343–394, pls. 26, figs. 3*).—In their studies of the transmission of boutonneuse fever by the brown dog tick the nymphs, males, and females were found infected in nature and to continue to be infected after hibernation. It was demonstrated experimentally that the infection may pass from the female through the eggs to the larvae or so-called seed ticks.

Bush sickness: Investigations concerning the occurrence and cause of bush sickness in New Zealand (*New Zeal. Dept. Sci. and Indus. Research Bul. 32 (1932), pp. 62, pl. 1, figs. 13*).—Part 1 of this contribution (pp. 5–20), by H. O. Askew and T. Rigg, deals with the occurrence of bush sickness at Glenhope, Nelson, New Zealand; part 2 (pp. 21–51), by L. I. Grange, N. H. Taylor, T. Rigg, and L. Hodgson, with the occurrence of bush sickness on the volcanic soils of the North Island; and part 3 (pp. 52–62), by T. Rigg and H. O. Askew, with soil iron in relation to the incidence of bush sickness.

Bang's disease (contagious abortion) in cattle, including treatment and control, and its relation to undulant fever in man, C. H. Kitselman (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 6, pp. 828–838*).—The author concludes that the economic factor involved in a herd infected by Bang's disease would justify an owner in eradicating the disease by means of the blood test and certain well-defined principles of sanitation.

The relation of the time element to the results obtained by the rapid agglutination test for the diagnosis of Bang's disease, C. R. Donham and C. P. Fitch (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 6, pp. 839–847*).—This contribution from the Minnesota Experiment Station calls attention to a source of error that occurs in the use of the rapid method of agglutination testing. Slow agglutination reactions with rapid agglutination antigens have been observed in the rapid test, the recommended time interval of 2 to 5 minutes before final observation of rapid agglutination tests not having been uniformly satisfactory.

"In many instances, higher titers were observed after longer time intervals. This constitutes a source of discrepancy in the results of the rapid agglutination test and in the results of this test as compared with the tube agglutination test for the diagnosis of Bang's disease. For use in the laboratory, the rapid test does not have any time advantage for the technician as compared with the test-tube method, if the tests with rapid antigen are held for 8 to 10 minutes before final observation. There is no evidence at present which indicates that this source of error in the results of the rapid agglutination test is of sufficient importance to defeat the object of the rapid test as a control measure for Bang's disease."

The presence of the Brucella Bang in the hygroma of the knee of cattle [trans. title], J. van der Hoeden (*Tijdschr. Diergeneesk., 59 (1932), No. 5, pp. 385–387, Ger., Eng., Fr. abs., p. 387; abs. in Cornell Vet., 22 (1932), No. 2, p. 204*).—*B. abortus* was detected by the author in the hygroma fluid of three of eight cows thus affected. Agglutinins were found in the fluid of five of the cows and complement fixing antibodies in seven. In two cases amboceptors

were present but agglutinins failed; in one case both were absent. Examination of the blood serum of three cows revealed also the presence of agglutinins and complement fixing antibodies.

Bacillus abortus Bang and bursitis in cattle [trans. title], H. MAGNUSSON (*Skand. Vet. Tidskr., 22 (1932), No. 2, pp. 33–49, figs. 2, Eng. abs., p. 48; abs. in Cornell Vet., 22 (1932), No. 2, pp. 201–203; Vet. Rec., 12 (1932), No. 20, p. 559*).—The occurrence of bursitis in adult cattle slaughtered at a packing plant during the months of March to December, 1931, was from 2 to 3 per cent. Of 203 cattle with bursitis, 39 per cent agglutinated; while of 1,055 cattle from the same section and of the same age which were without bursitis, only 12 per cent reacted to the agglutination test for *B. abortus*. *B. abortus* was proved to exist in the bursitis fluid of 11 cases. In one instance, there was observed an old dry bursitis with caseous foci, from which virulent *B. abortus* bacilli were isolated. *B. abortus* bacilli were found in bursitis contents in animals which had as low agglutination titer of the blood as 1:50. The author concludes that *B. abortus* is probably not the primary cause of bursitis. On the other hand, bursitis may easily become long-period reservoirs for *B. abortus* in the same way as the udder in abortive cows.

Contagious abortion in the experiment station dairy herd, L. W. INGHAM and DEV. MEADE (*Maryland Sta. Bul. 331 (1932), pp. 31–42*).—The authors here report upon the methods used and the results secured in the eradication of contagious abortion from the station dairy herd, in which it is known to have been present continuously from 1908. In that year 34 per cent of the cows aborted, while on January 24, 1930, the last infected cow was removed. From September, 1925, to June, 1929, the partial isolation plan was used with little success in the attempt to control the disease. A change in the method of combating the disease, with the isolation of infected cows, was put into operation in June, 1929, since which time positive and negative cows have been kept separated. Only one cow in the negative herd has since been found to react positively to the agglutination test. The disease reached its greatest proportions in 1928, when 58.6 per cent of the cows reacted positively to the agglutination tests and 36.9 per cent of the calves were aborted.

The importance of the disease from a monetary standpoint is shown in the fact that 42 cows with 105 comparable records calculated to mature equivalents and covering the years 1908 to 1930, inclusive, gave 34.18 per cent less milk and 31.84 per cent less fat following an abortion than they did following a normal calving. For the past 5-year period, 1926–1930, the positive cows gave 21.7 per cent less milk and 23.1 per cent less fat than the negative cows, all records calculated to mature equivalents.

The percentage of abortions has decreased from 36.9 in 1928 to 6.7 for both herds combined in 1930. There were only two abortions in the positive herd and no abortions in the negative herd in 1930. The average number of normal calves per cow year for the 4-year period, 1926–1929, is 0.47 for the positive cows and 0.75 for the negative cows, while in 1930 this number was increased to 0.88 for the positive cows and 1.06 for the negative cows. For the positive cows the percentage of calvings with retained placentas was reduced from 33.3 per cent for both 1927–1928 to 0 in 1930. There has been a decided improvement in the appearance and general condition of the herd since the two herds were separated, and apparently both the positive and negative cows were benefited by the separation. The number of services per cow that calved was 11 per cent higher on the positive than on the negative cows for the period 1926–1930. Frequent agglutination testing of the negative herd along with the isolation of positive cows has proved very satisfactory as a method of controlling contagious abortion.

Epizootic lymphangitis: Mycelial forms of the parasite in a natural case, S. C. J. BENNETT (*Jour. Compar. Path. and Ther., 45 (1932), No. 2, pp. 158–160, figs. 3*).—The authors place on record the observation of mycelial forms of *Cryptococcus farciminosus* in a naturally occurring case of epizootic lymphangitis.

On the principal types of piroplasm observed in bovines in Egypt, M. CARPANO, trans. by E. TALAREWITCH (*[Egypt] Min. Agr., Tech. and Sci. Serv. Bul. 116 (1932), pp. 20, pls. 7*).—An account is given of the piroplasmosis-like diseases met with in bovines in Egypt, namely, piroplasmosis due to *Piroplasma bigeminum bovis;* babesiellosis due to *Babesiella bovis;* gonderiosis due to *Gonderia mutans;* theileriosis, or Mediterranean coast fever, due to *Theileria annulata;* and anaplasmosis due to *Anaplasma marginale.*

Ichthargan in the treament of various piroplasmoses [trans. title], RICAUD and CAMUS (*Bul. Acad. Vét. France, 5 (1932), No. 1, pp. 43–46; abs. in Vet. Rec., 13, (1932), No. 22, p. 614*).—Ichthargan, a synthetic preparation of ichthyol and silver containing 30 per cent silver and 15 per cent sulfur and administered intravenously at the rate of 16 grains dissolved in 2 oz. of water for a 1,000-lb. animal, is an effective cure. Doses of 1.5 and even 2 g have been used, followed in most cases by a cure in 24 hours. Unlike trypanblue, which cures true piroplasmosis (and not babesiellosis) only when administered on the fifth day, ichthargan cures even from the first day and does not color the flesh.

A virus disease of parrots and parrakeets differing from psittacosis, T. M. RIVERS and F. F. SCHWENTKER (*Jour. Expt. Med., 55 (1932), No. 6, pp. 911–924, pls. 3, figs. 3*).—The authors find that the virus of parrots and parrakeets discovered by other workers is unrelated to the agent causing psittacosis either in birds or in men, is fairly species-specific, and manifests itself chiefly by the production of areas of focal necrosis in the liver and acidophilic intranuclear inclusions in affected cells.

Observations on the possible transmission of surra by the land leech, Haemadipsa zeylanica, M. A. TUBANGUI (*Philippine Jour. Sci., 48 (1932), No. 1, pp. 115–127, pl. 1*).—In experiments conducted with two species of leeches it was determined that the surra parasite can not long survive in the digestive tract of the water leech, *Hirudinaria manillensis* (Lesson), and that this leech does not transmit surra directly or indirectly. It was infective up to 1 hour and 20 minutes after biting but not after 2 hours and 10 minutes. On the other hand, positive results were obtained in work with the land leech, *H. zeylanica* (Moquin-Tandon), transmission by which was direct or mechanical, the infection being conveyed in the proboscis as the result of a previons contamination and retained for as long as 30 minutes. In the digestive tract of *H. zeylanica* it remained viable up to 4 hours and 15 minutes but not 5 hours and 45 minutes after feeding.

The behavior and transmission of trypanosomiasis in the canary, Serinus canarius, R. D. MANWELL (*Anat. Rec., 51 (1931), No. 1, Sup., pp. 84, 85*).—It is pointed out that the work by MacFie and Thomson in 1929 and by the author made it almost certain that the chicken mite serves as the invertebrate host of the trypanosome, probably a variety of *Trypanosoma paddae*, although it closely resembles *T. gallinarum.* Three of seven attempts to transmit the parasite by direct blood inoculation were successful, but only very slight infections were produced. It is considered questionable whether any multiplication of the parasites occurred in the blood of birds so infected.

Melanosis in cattle, W. SCOTT (*Jour. Compar. Path. and Ther., 45 (1932), No. 2, pp. 141–149, figs. 4*).—Following a brief review of some of the cases of melanosis mentioned in the literature, the author reports upon 10 cases studied.

Demodectic (follicular) mange in cattle, R. B. Little (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 6, pp. 922–926, figs. 2*).—This is a report upon the occurrence of demodectic mange in 9 cows in a dairy herd of 100.

Studies in louping-ill (an encephalomyelitis of sheep), I, W. S. Gordon, A. Brownlee, D. R. Wilson, and J. MacLeod (*Jour. Compar. Path. and Ther., 45 (1932), No. 2, pp. 106–140, figs. 7*).—Section A (pp. 109, 110) of this account consists of a note on the infectivity of blood and section B (pp. 111–126) of a preliminary note on the nature of tick-borne fever.

The authors conclude that it has been proved that louping ill is due to a distinct filter passing virus. "The clinical manifestations of typical louping ill are due to infection of the central nervous system with this virus. The virus has been detected in the blood in cases in which symptoms of louping ill did not subsequently develop. The symptoms of infection in such cases is a febrile reaction occasionally followed by death. . . . Recovery from the infection, either naturally or experimentally produced, results in immunity to louping ill. The evidence so far indicates that the use of a living virus for prophylactic immunization is not a safe procedure. As a result of the experimental investigation of louping ill, it has been shown that ticks (*Ixodes ricinus*) which transmit the virus also harbor another infective agent which causes febrile disease in sheep. Cross-immunity experiments have shown that this disease is distinct from louping ill. The nature of the causal agent is so far unknown."

Louping-ill, J. R. Greig (*Highland and Agr. Soc. Scot. Trans., 5. ser., 44 (1932), pp. 26–51*).—This extended account includes a report of investigations conducted in 1930 and 1931 and is in continuation of earlier work (E. S. R., 65, p. 379). Reference is made to a review of the literature on the subject by Pool (E. S. R., 67, p. 167).

The association of the bacillus of Preisz-Nocard with lesions caused by *Oesophagostomum columbianum* in sheep, H. R. Carne and I. C. Ross (*Jour. Compar. Path. and Ther., 45 (1932), No. 2, pp. 150–157*).—Five lambs were simultaneously drenched with cultures of Preisz-Nocard bacilli and larvae of *O. columbianum*. "In spite of marked lesions of esophagostomiasis of the bowel wall and the presence of considerable numbers of other intestinal nematodes, lesions caused by the Preisz-Nocard bacillus only occurred in one mesenteric gland in one animal (which was also affected in the right prescapular gland), though infection of the submaxillary lymph glands occurred in three animals. Lesions caused by wandering Oesophagostomum larvae were present in 12 abdominal lymph glands and 3 livers. These lesions were free from bacteria. The histological pictures in lesions of *O. columbianum* and Preisz-Nocard bacilli in lymph glands are characteristic and readily distinguished from each other. Bacteriological examination of Oesophagostomum nodules from the bowel wall failed to reveal the presence of the Preisz-Nocard bacillus, though other bacteria were recovered from a proportion of the nodules.

"The authors are of the opinion that injuries of the intestinal mucosa caused by intestinal parasites, more particularly by *O. columbianum*, are not a common portal of entry of the Preisz-Nocard bacillus under natural conditions."

Some bipolar organisms found in pneumonia in sheep, I. E. Newsom and F. Cross (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 5, pp. 711–719*).—This is a report of a biochemical and serological study made at the Colorado Experiment Station of 20 strains of bipolar organisms isolated from cases of pneumonia in sheep and six from pneumonia in cattle. It was found that the organisms isolated from sheep and cattle can be divided biochemically and serologically into at least four subgroups that cross species lines. It is con-

sidered desirable to give the atypical pasteurellae a specific name, and *Pasteurella hemolytica* is proposed.

The stiff lamb disease, J. P. Willman, S. A. Asdell, W. T. Grams, and W. A. Hagan (*Amer. Soc. Anim. Prod. Proc. 1931, pp. 231–234*).—In this contribution the authors report briefly on experiments relating to stiff lamb disease (E. S. R., 66, p. 658), which has been known for many years in New York State, where it has caused large losses annually in the spring lamb crops, and has been reported from Pennsylvania, Maryland, Ohio, Michigan, Wisconsin, Montana, Oregon, and Nevada. Although the authors have been able to produce stiff lambs under certain conditions, which include lack of exercise of the ewes before lambing, heavy grain feeding during the winter, the feeding of high protein grain mixtures together with alfalfa or clover hay, lack of succulent feeds, a slight decrease in the amount of grain fed to ewes after lambing, and the lack of a lamb creep for feeding lambs separately, they are not prepared to draw any definite conclusions.

Tuberculosis in goats in India, P. R. Krishna Iyer (*Indian Jour. Vet. Sci. and Anim. Husb., 2 (1932), No. 1, pp. 41–48, pls. 2*).—This is an account of tuberculosis in goats in India, in which animal it has never before been recorded in Indian literature. Its occurrence is said to be by no means as low as originally supposed, it having been found in one abattoir to be as high as 16 per cent.

Idiopathic anemia in newborn pigs, R. Graham and F. Thorp, jr. (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 6, pp. 863–879, figs. 11*).—In this contribution from the Illinois Experiment Station the authors report upon a fatal sporadic disease in newborn pigs, 2 days to 2 weeks of age, which showed gross pathologic lesions suggestive of anemia. "The etiologic factors are not definitely known. The relation of poor pastures for sows during gestation to anemia in newborn pigs, though suggested by clinicians, remains an unproven conjecture. The occurrence of idiopathic anemia of newborn pigs raises the question of the relation of the disease to so-called secondary anemia. Brucelliasis or other primary bacterial infections were not incriminated as etiologic agents in cases coming to our attention."

Observations on the transmissibility of hog cholera and its prevention by quarantine, T. J. Curphey (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 6, pp. 886–890, figs. 3*).—The author here reports observations which clearly show that it is possible by suitable precautions to prevent infection of highly susceptible hogs present in an environment heavily seeded with the virus of hog cholera for a period longer than eight weeks, or a time well beyond that of incubation of the disease.

Cases of poisoning in the horse with ratti seeds (Abrus precatorius) by oral administration, K. S. Simpson and P. C. Banerjee (*Indian Jour. Vet. Sci. and Anim. Husb., 2 (1932), No. 1, pp. 59–65, pl. 1, figs. 2*).—Ratti seeds administered orally in doses from 0.5 oz. upward were found to be extremely toxic to horses although comparatively harmless to dogs, goats, and cattle. The seeds produce symptoms of colic and high temperature, followed by a period of lassitude and disinclination to move. Post-mortem appearances are those of a highly irritant poison.

Equine microfilariasis: A short review of the literature, S. K. Sen (*Indian Jour. Vet. Sci. and Anim. Husb., 1 (1931), No. 2, pp. 143–149*).—The literature on equine microfilariasis is reviewed in connection with a list of 28 references.

A hemolytic streptococcus associated with lumbar paralysis in mules, A. G. [illegible] (*Calif. Dept. Agr. Mo. Bul., 21 (1932), No. 2–3, pp. 233–235, fig. 1*).—

A brief account is given of an outbreak of lumbar paralysis in a herd of 70 4-to-6-year-old mules in Merced County, Calif. A pure strain of hemolytic streptococcus was grown from primary cultures of the liver and spleen in the first two cases autopsied. The disease appeared to be identical with enzootic spinal paralysis, described by Hutyra and Marek, a disease which it is believed has not heretofore been reported in the United States.

The association of "Rhabditis strongyloides" with dermatitis in dogs, B. G. Chitwood (*North Amer. Vet., 13 (1932), No. 6, pp. 35–40, fig. 1*).—The experiments here reported led to the conclusion that infestation of dogs with *R. strongyloides*, even as a secondary invader, occurs only under rare conditions. A list is given of 16 references to the literature.

Studies on canine distemper.—I, The bacteriology of one hundred naturally infected cases, A. S. Schlingman (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 5, pp. 729–744, fig. 1*).—The results of studies of 100 dogs showing the symptom complex commonly diagnosed as canine distemper showed *Bacillus bronchisepticus* to be present in 81 per cent of the cases. A hemolytic streptococcus was found in 9 per cent of the cases examined, and in 6 per cent *Staphylococcus albus* only was recovered. The latter organism is thought to have been a secondary invader. The symptom complex of canine distemper was produced in susceptible pups following the intratracheal injection of suspensions of recently isolated *B. bronchisepticus*.

The anthelmintic value of kamala for tapeworms in chickens, R. E. Rebrassier (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 6, pp. 895–903*).—In work conducted by the Ohio State University in cooperation with the Ohio Experiment Station, powdered kamala in doses of 7.5, 10, and 15 grains was administered to 128 chickens, about 1 year of age, to determine the efficiency of the drug in removing tapeworms.

"The droppings of each bird, voided over a period of 48 hours after treatment, were examined for tapeworms both grossly and under the wide-field binocular microscope. These birds were held for a period of at least 14 days after treatment under conditions intended to prevent reinfection. They were then killed and examined for tapeworms. Three birds completely eliminated tapeworms after treatment with 15 grains of kamala, but in none of the birds receiving 7.5 and 10 grains was complete elimination obtained. Sixteen birds passed fragments of tapeworms after treatment, but on post-mortem examination all showed the presence of tapeworms. Twenty-seven birds passed no tapeworms with the droppings after treatment, but all were found to harbor them on post-mortem examination. The tapeworms examined were found to be species of *Davainea proglottina, Choanotaenia infundibulum, Raillietina cesticillus*, and *Hymenolepis carioca*."

Studies of some virus diseases of fowls, C. A. Brandly and L. D. Bushnell (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 5, pp. 782–790*).—This contribution from the Kansas Experiment Station reports upon virus diseases of fowls under the headings of occurrence and transmission, manifestations and course, control, and experimental studies of fowl pox and infectious tracheobronchitis.

Molds in respiratory tract of chickens, W. W. Thompson and F. W. Fabian (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 6, pp. 921, 922*).—A post-mortem examination made of two fowls from two flocks with high mortality rates, received at the laboratory at Michigan State College, resulted in the finding of *Penicillium glaucum* and *Rhizopus nigricans* in the trachea and bronchi, *P. glaucum* in the air sac, and *P. glaucum, Aspergillus niger*, and *R. nigricans* in the lungs. The authors conclude that while Aspergillus and Mucor may be

definitely associated with the disease, there is considerable doubt about Penicillium being the primary cause, in their opinion it being merely a secondary invader.

Infection of the cloaca with the virus of infectious bronchitis, C. B. Hudson and F. R. Beaudette (*Science, 76 (1932), No. 1958, p. 34*).—In experimental work with laryngotracheitis at the New Jersey Experiment Stations the authors produced an infection in the cloaca of a fowl through the introduction of an infected cotton swab. After three days an acute inflammation developed in the proctodeumal portion of this structure. Four days later an infected cotton swab from this fowl was introduced into the cloaca of another, which, in turn, showed the same disease process. The virus is said to have been carried through four more generations at intervals of three days. These birds showed the typical symptoms of the disease, and all but one of the five inoculated recovered. The recovered birds were tested for immunity at the close of the experiment and found resistant to cloacal infection. Those previously attacked in the cloaca resisted tracheal inoculation, and those recovered from tracheal inoculation resisted cloacal infection.

Blood-cell counts in acute avian laryngotracheitis, F. Thorp, jr., and R. Graham (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 6, pp. 909–913, figs. 2*).—In work at the Illinois Experiment Station "the erythrocyte counts of 71 chickens suffering from acute laryngotracheitis averaged 2,596,000 per cubic millimeter of blood, suggesting that in chickens suffering from acute laryngotracheitis there is no significant deviation from the normal number of erythrocytes. The average number of leucocytes encountered in the same chickens was 11,900 per cubic millimeter of blood, which is slightly lower (100) than the minimum range in normal chickens as noted by Warthin (quoted by Burnett [E. S. R., 38, p. 481]). When compared with 18,000 leucocytes per cubic millimeter of blood in normal chickens, the minimum reported by Burnett, there is an average reduction of approximately 6,000 leucocytes per cubic millimeter of blood noted in fowls suffering from acute laryngotracheitis."

[Studies of leucosis of the fowl] (*Compt. Rend. Soc. Biol. [Paris], 109 (1932), No. 13, pp. 1213–1224*).—Contributions on leucosis of the fowl include the following: The Experimental Production of Leucosiform Conditions in the Fowl, by O. Thomsen and J. Engelbreth-Holm (pp. 1213–1215); The Interrelation of the Several Forms of Leucosis of the Fowl, by J. Engelbreth-Holm (pp. 1216–1218); Transmission of the Leucosis of the Fowl to Chicks, by J. Engelbreth-Holm and A. R. Meyer (pp. 1219–1221); and Erythroleucosis (Erythrosis) of the Fowl, by J. Engelbreth-Holm (pp. 1222–1224).

Studies of leukemia of fowls, R. Fenstermacher (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 5, pp. 791–799*).—The author was unsuccessful at the Minnesota Experiment Station in his efforts to transmit the strain of lymphatic leukemia that affected a group of White Minorca birds by injection of Berkefeld N filtrates obtained from the liver and spleen of a bird affected with lymphatic leukemia. Contact birds failed to show evidence of the disease while under observation for 10 months. Tables are given which record the average monthly blood counts of 12 normal birds for 10 months and the daily red and white cell counts of 2 affected birds, extending over periods of more than 60 days.

A study of lymphomatosis of fowls (fowl paralysis), E. P. Johnson (*Virginia Sta. Tech. Bul. 44 (1932), pp. 22, figs. 13*).—Following a brief introduction the author reviews the literature and deals with the manifestations of the various forms of lymphomatosis. Studies of the pathology and bacteriology of the disease are then reported upon, followed by a discussion of the

effects of coccidiosis on the susceptibility toward lymphomatosis, and transmission experiments.

It is pointed out that paralysis is only a symptom of one form of lymphomatosis. It appears that blindness due to iritis as well as the visceral form of this disease is increasing in prevalence. The author finds the lesions to indicate "that the term lymphomatosis should be used, as it is descriptive of the true nature of the disease. For the form involving the nervous system and bringing on symptoms of paralysis neurolymphomatosis and for the visceral form visceral lymphomatosis should be used. Lymphomatous iritis for the eye form would also be a more descriptive term."

In experiments with birds 2 months or more of age no organism or filtrate was found which was capable of producing infection. Coccidiosis did not seem to render birds more susceptible to any substance in the tissues of a bird with symptoms and lesions of paralysis and blindness. Incubation in soil under the various conditions in these experiments did not render any substance in the respiratory, genital, or digestive tracts of a paralyzed bird more capable of producing these conditions in birds 2 to 6 months of age.

Transmission through the egg did not occur in the case of 2 hens that were paralyzed and recovered. One hen which has never been paralyzed appeared normal but produced a comparatively large number of birds that developed paralysis. This would seem to be due to a transmitted weakness or susceptibility to an exciting agent rather than the transmission of the causative factor as she is still in good health, or there is a possibility of her being a carrier. The author considers it possible that the condition is due to an infectious agent which attacks chicks very soon after hatching, and that a large number of birds with a slight attack develop immunity, while in others the various forms of the disease may develop.

An ataxia of chicks associated with nephritis, G. L. DUNLAP (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 6, pp. 880–885, figs. 3*).—In this contribution from the Massachusetts Experiment Station the author describes some of the lesions and changes found in chicks sent to the laboratory with an affection which the poultrymen have termed "crazy chicks." This condition, first observed by the author in 1928, was reported as having caused quite heavy losses in 1927. The symptoms observed in growing chicks, which occur at a definite age, consist of muscular incoordination, twitching or tremor of the head and legs, and retraction of the head. "Gross changes are nephritis and proventriculitis. Microscopical changes consist of an albuminous degeneration of kidneys and interstitial hemorrhages. The proventriculus is swollen and presents a separation of the glandular epithelium from its basement membrane. The uric acid content of the blood of affected chicks is two to six times greater than in normal avian blood. The histological and blood findings indicate an impairment of nitrogenous metabolism. Histories of field cases indicate high protein intake with forced feeding and very rapid growth as the exciting cause."

The infection of fowls in Chile by Bacillus pullorum [trans. title], H. VACCARO (*Compt. Rend. Soc. Biol. [Paris], 110 (1932), No. 22, pp. 629, 630*).—A description is given of the characteristics of *B. pullorum* isolated from Rhode Island Red chicks in Chile.

A variant occurring naturally in cultures of Salmonella pullorum, P. R. EDWARDS (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 6, pp. 891–894, figs. 2*).—In the course of studies at the Kentucky Experiment Station it has been observed "that numerous cultures of *S. pullorum* have a marked tendency to form secondary colonies on the primary growth. From these secondary col-

onies cultures have been isolated which form large colonies on agar plates and produce a heavy growth on agar streaks. The variant is quite stable and possesses the biochemical and serological properties of the parent. It is suggested that such cultures used in routine antigen production would greatly lessen the effort to prepare large amounts of this reagent."

A modification of the rapid agglutination test for pullorum disease, H. Welch (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 5, pp. 778–781*).—In comparative tests made at the Montana Experiment Station of the wet and dry blood smears, in six flocks in which the stained antigen was used, the dry blood smear averaged 94 per cent as accurate as the wet.

Salmonella infections in ducklings, N. Holk (*Jour. Compar. Path. and Ther., 45 (1932), No. 2, pp. 161–171*).—In investigations of the cause of three epizootics occurring in ducklings, an organism apparently identical with *B[acillus] enteritidis* was found in one and organisms closely allied to *B. aertrycke* were isolated in the other two. The results of the investigations point to a distinct possibility of egg transmission. In the author's opinion, *B[acterium] anatum* or keel disease has not yet been identified in England.

A preliminary report on a mycosis of turkeys, A. G. Gierke (*Calif. Dept. Agr. Mo. Bul., 21 (1932), No. 2–3, pp. 229–231*).—A brief account is given of a study of mycosis of turkeys, material from widely separated areas in California having been received during the last week of June and through July, 1931, accompanied by reports of from 8 to 20 per cent flock mortality. In two flocks observed by the author, aside from the crop mycosis, up to 50 per cent of the autopsied birds showed extensive lesions of aspergillosis in the lungs and air sacs. Serious outbreaks of aspergillosis in very young birds, although not common, have been observed to some extent each year. It is, however, unusual for such a severe epizootic to occur in turkeys at 2 and 3 months of age. The fungus isolated is said to closely resemble *Oidium albicans*, the cause of thrush.

Turkeys to the number of 12,000 which hatched in April and May with a total loss of 1,500 birds in the first 2 or 3 weeks escaped further loss, the birds having grown exceptionally well on a ration which was before the flock at all times, fermented mash fed twice daily, and clabbered skim milk and chopped green alfalfa given once a day. About the middle of June the April turkeys started ranging on poorly developed, unharvested barley; losses accounting for 650 birds began the first week in July and continued through the entire month. The first deaths in the May hatch, which had not yet been put on range, occurred about the second week in July and continued throughout the month, aggregating approximately 250 turkeys. The fermented mash was then discontinued and all stock moved to green alfalfa range, where most of the noticeably affected birds promptly recovered. Very few cases developed, and on August 15 the flock appeared to be in excellent condition. Three or four autopsies on birds which died during the second and third weeks in August revealed lesions of aspergillosis in the lungs and air sacs, but no evidence of crop mold.

Studies of tuberculosis of turkeys, W. R. Hinshaw, K. W. Niemann, and W. H. Busic (*Jour. Amer. Vet. Med. Assoc., 80 (1932), No. 5, pp. 765–777, figs. 5*).—This is a preliminary study of tuberculosis of turkeys in California and Nevada, in which it was found to be of economic importance only in areas where it is prevalent among chickens. The work is being conducted cooperatively by the California Experiment Station, the University of Nevada, and Lassen County, Calif.

Trichostrongylus colubriformis (=T. instabilis) in the jack rabbit (Lepus californicus melanotis), L. V. Skidmore (*Jour. Amer. Vet. Med.*

Assoc., 80 (1932), No. 5, pp. 800, 801).—In this contribution from the Nebraska Experiment Station the author records the finding of large numbers of *T. colubriformis* in five jack rabbits killed in the vicinity of Lincoln, Nebr. Although known to be a common parasite of ruminants, this is said to be the first record of its occurrence in jack rabbits or related mammals.

A general account of the helminth parasites affecting domestic animals in India, with methods of collection, preservation, staining, etc., G. D. BHALERAO (*Indian Jour. Vet. Sci. and Anim. Husb., 2 (1932), No. 1, pp. 1–28*).—This general account omits the class Acanthocephala.

Susceptibility and resistance to helminthic infections, A. C. CHANDLER (*Jour. Parasitol., 18 (1932), No. 3, pp. 135–152, fig. 1*).—This account was presented as the address of the acting president of the American Society of Parasitologists, December 29, 1931. A list of 41 references to the literature is included.

The chemotherapy of helminth infestations, P. D. LAMSON and C. B. WARD (*Jour. Parasitol., 18 (1932), No. 3, pp. 173–199, figs. 4*).—This contribution is presented in connection with a list of 90 references to the literature.

AGRICULTURAL ENGINEERING

[**Agricultural engineering investigations at the Texas Station**], H. P. SMITH, D. T. KILLOUGH, D. SCOATES, D. L. JONES, B. H. HENDRICKSON, R. W. BAIRD, H. V. GEIB, H. O. HILL, R. E. DICKSON, and B. C. LANGLEY (*Texas Sta. Rpt. 1931, pp. 96–98, 113–116, 133, 134, 140, 141*).—The progress results are briefly presented of studies on the mechanical harvesting of cotton, factors of efficiency in the distribution and placement of cottonseed and fertilizer, soil erosion, types of terraces, soil erosion prevention and moisture conservation by strip cropping, strip subsoiling and terracing, and run-off in relation to soil erosion. The work on soil erosion and related features is being conducted in cooperation with the U. S. D. A. Bureaus of Agricultural Engineering and Chemistry and Soils.

Standard symbols and glossary for hydraulics and irrigation, compiled by D. C. HENNY ET AL. (*Amer. Soc. Civ. Engin. Proc., 58 (1932), No. 5, pt. 1, pp. 729–755*).—This set of standard symbols and glossary of terms used in irrigation hydraulics has been prepared by a special committee on irrigation hydraulics to correct differences of opinion regarding the definition and interpretation of certain commonly used terms.

Twenty-five years of supplemental irrigation investigations in Willamette Valley, W. L. POWERS (*Oregon Sta. Bul. 302 (1932), pp. 30, figs. 14*).—The results of 25 years of experiments with supplemental irrigation in the Willamette Valley are summarized.

It has been found that the normal rainfall in the valley from May 1 to October 1 is 5.43 in., whereas the loss by evaporation from a Weather Bureau tank averaged 26.615 in. for the same period.

Soil and ground water surveys of the valley indicate that more than one-half million acres of naturally drained and free-working soil are well situated and suitable for irrigation for diversified crops, while nearly another half million acres with less perfect drainage are fairly suitable for irrigation for pasture or forage crops.

The crops found to give best response to supplemental irrigation are the small fruits and truck crops, those crops grown for intensive dairying such as pasture and late cuttings of legume crops, or row crops that make maximum growth late in the season, such as roots and corn. Potatoes and beans are cash crops that give large returns from small amounts of irrigation.

The Willamette drainage system affords a large potential water supply for gravity and pump irrigation. Under large areas of river bottom land and part of the main valley floor, water can be developed by means of wells tapping the gravel substratum. This water is usually of good quality.

During the 25-year period, with water at the maximum price of $1 an acre-inch, an average depth of 6.44 in. yielded an average net gain in profit from irrigation of $8.80 per acre. The data indicate that in the valley it should pay to pump about 25 to 40 ft. for pasture, alfalfa, or clover, and more than twice this height for potatoes or berries. Crop rotation with manure each rotation and with supplemental irrigation more than doubled the yield and profit per acre-inch and cut in two the water cost per pound of dry matter. It increased the nitrogen content and capacity of the soil to hold nutrient bases, such as calcium and potassium, in nearly available form.

Irrigation canal structures, R. H. Roberts (*Rhodesia Agr. Jour., 28 (1931), No. 3, pp. 249–261, figs. 5*).—General descriptions are given of the structures required on irrigation systems of moderate size, which are most common in Southern Rhodesia. These include intake works, sluice gates, spillways, flumes, inverted siphons, gauging weirs and notches, road crossings, and drops.

Surface water supply of Hawaii, July 1, 1928, to June 30, 1929 (*U. S. Geol. Survey, Water-Supply Paper 695 (1932), pp. V+101*).—This report, prepared in cooperation with the Territory of Hawaii, presents the measurements of flow made on certain streams and ditches in the Territory during the year ended June 30 1929.

Annual report of the department of water supplies and sewage disposal for the year ending June 30, 1931, W. Rudolfs (*New Jersey Stas. Bul. 529 (1932), pp. 64, figs. 19*).—This report presents the progress of studies on Performance of Experimental Trickling Filters During Winter and Summer, by Rudolfs, N. S. Chamberlin, and H. Heukelekian (pp. 4–16); Common Protozoa in Filter Beds, by Rudolfs (pp. 16–19); Biochemical Changes and Loss of Nitrogen During Prolonged Aeration of Sewage, by Heukelekian and Chamberlin (pp. 20–31); Effect of Narrowing the Carbon-Nitrogen Ratio on Sludge Digestion, by Rudolfs and L. R. Setter (pp. 31–37); Effect of Trade Wastes on Thermophilic Sludge Digestion: I. Comparison of the Digestion of Trenton (Containing Pickling Liquor Wastes) and Plainfield Solids (Domestic), by Heukelekian (pp. 37–41); Effect of Indole and Skatole on Digestion, by Rudolfs and Chamberlin (pp. 41–45); Digestion of Activated Sludge Mixed with Fine Screenings, by Rudolfs and I. O. Lacy (pp. 45–48); Distribution of Solids in a Digestion Tank, by Rudolfs and C. N. Henderson (pp. 48, 49); Studies on the Protozoan Fauna of Sewage Disposal: I, Comparison of Plants, by J. B. Lackey (pp. 49–54); and Note on Effect of Chlorine on Bacteria in Sludge, by Rudolfs (pp. 54–56).

An abstract section, lists of references and publications, and other data are also included.

Soft water for the home, A. M. Buswell and E. W. Lehmann (*Illinois Sta. Circ. 393 (1932), pp. 16, figs. 6*).—This circular presents practical information on how to secure an adequate supply of clean rain water, how to soften well water in cisterns, and on the use of a zeolite water softener.

Reinforced brickwork: A new construction material (*Engin. News-Rec., 109 (1932), No. 3, pp. 71–74, figs. 7*).—Early and recent applications of steel reinforced brick construction to different types of structures are briefly described, and the results of tests to determine the strength of beams and slabs, reported from different sources, are summarized.

The steel reinforcement consists mainly of straight, deformed bars or rods with loops or ties in the columns. Bent bars and stirrups are used in some

cases to resist shear, and wire mesh has been used to some extent. It is considered advisable to have a minimum thickness of 0.125-in. mortar on bars up to 0.5 in. in size, with a greater thickness (up to 0.25 in.) on larger bars. Mortar joints are made slightly thicker where the reinforcing occurs.

The conspicuous results of the tests have been (1) the high breaking loads as compared with the design live loads, (2) the slight deflection under heavy loads, and (3) the frequent full recovery from deflection after removal of the load. In tests to destruction the failures are reported to have been by diagonal tension where beams were not reinforced with bent bars or stirrups, or both. In slabs and in beams reinforced for shear, the failures have been almost invariably in the mortar, without crushing of the bricks, but in some tests bricks have cracked in tension under ultimate loads.

An investigation of the performance characteristics of reinforced brick masonry slabs, J. W. Whittemore and P. S. Dear (*Va. Polytech. Inst., Engin. Expt. Sta. Bul. 9 (1932), pp. 63, figs. 21*).—In studies of the effect of the physical properties of shale and clay bricks on the performance characteristics of reinforced brickwork slabs, 5 reinforced slabs each of hard burned, medium burned, and soft burned clay and shale brick, making a total of 30 slabs, were tested.

In general, the performance characteristics of the shale brick slabs were slightly superior to the performance characteristics of the clay brick slabs. Slabs constructed from the softer fired bricks performed better under load than those constructed from the harder fired bricks. In practically every case during the testing of the 30 slabs, the initial failure occurred before the allowable deflection was reached. The instantaneous recovery performance of the slabs, even well past the design load, was very favorable. The deflection performance of the slabs was also very good. These facts warrant the conclusion that all slabs tested during the investigation possessed ample stiffness until well past the design load.

Under ordinary circumstances of slab design, the compressive strength and the transverse strength of the individual bricks are apparently of minor importance in the performance of the slab. As a general rule, any well-fired brick has sufficient strength to introduce an ample factor of safety in respect to the ultimate strength of the brick masonry.

In reinforced brick masonry construction, the percentage of absorption of the individual brick assumes the greatest importance of the usually determined physical properties of the brick. The strength of adhesion of mortar to brick and of mortar to steel are very important items.

During the investigation it was noted that the best slab performances were associated with bricks having the highest percentage of absorption and having the greatest strength of adhesion of mortar to brick. This indicates that there is a direct relationship between absorption and mortar joint strength.

Surface characteristics and texture of the individual bricks are important factors in the performance of reinforced brick masonry, since they influence mortar joint strength. Bricks with roughened surfaces exposed to union with the mortar greatly aid mortar joint strength and slab performance. Reinforced brick masonry slabs constructed by grouting the mortar joints are apparently well able to withstand design loads. The widely used 1-1-6 mortar mix is adaptable to the construction of slabs by grouting the mortar joints. Though plain round reinforcing rods are adaptable to reinforced brick masonry slab construction, it is the opinion of the investigators that deformed rods would be more desirable since they would promote greater bond strength between the mortar and the steel.

All bricks should be wetted before use in reinforced brick masonry. The degree of wetting should be governed by the absorption of the individual bricks. Bricks with high absorption should be wetted more thoroughly than bricks with low absorption in order to prevent the destruction of the mortar strength by decreasing the water-cement ratio. Quality of workmanship is an important factor in slab performance.

The actual stresses in steel and brickwork, as experimentally determined, are well below those calculated by reinforced concrete design formulas. It is evident that the formulas of reinforced concrete are adaptable, with slight modifications, to reinforced brick masonry design.

Reinforced brick masonry slabs perform in a very similar manner to reinforced concrete slabs and are, therefore, theoretically and experimentally practicable.

A short bibliography is included.

Studies on the action of sulphates on Portland cement.—IV, The action of sulphate solutions on mortars prepared from some binary and ternary compounds of lime, silica, alumina, and iron, T. THORVALDSON, D. WOLOCHOW, and V. A. VIGFUSSON (*Canad. Jour. Research, 6 (1932), No. 5, pp. 485–511, figs. 8*).—Studies conducted at the University of Saskatchewan in cooperation with the National Research Council of Canada on the action of solutions of the sulfates of magnesium, sodium, and calcium on 1:10 mortar prisms are reported (E. S. R., 62, p. 568).

The prisms were made with standard sand and the following substances or mixtures of these: Tricalcium silicate, β-dicalcium silicate, γ-dicalcium silicate, tricalcium aluminate, $5CaO.3Al_2O_3$, monocalcium aluminate, $3CaO.5Al_2O_3$, dicalcium ferrite and $4CaO.Al_2O_3.Fe_2O_3$. Some of the experiments dealt with mortars of richer mix (1:7.5 and 1:5). The effect of the solutions was determined by measuring the linear expansion of the prisms and the tensile strength when the measurements of expansion were discontinued. A very pronounced difference was found to exist between the behavior of mortars made with mixtures rich in tricalcium silicate and those rich in β-dicalcium silicate. This observation is applied in the detailed discussion of the resistance of the different types of hydraulic cements to the action of sulfate solutions.

How to avoid faulty concrete in small structures (*Purdue Univ., Engin. Ext. Ser. No. 27 (1932), pp. 154, figs. 95*).—This bulletin presents technical information of practical use to designing and constructing engineers on the proper preparation and use of concrete in small structures, with special reference to the avoidance of faulty material. Among others it contains chapters on buying and handling cement; sand, gravel, and stone; harmful substances in Indiana aggregates; aggregate sizes and grading; water and consistency; the mix; batching; estimating quantities of materials; mixing; plant and equipment; forms; reinforcement; from mixer to forms, placing; joints, cracks in concrete; finishing concrete surfaces; keep new concrete damp; cold weather methods; water-tight concrete; special concretes; faulty concrete construction; specifications; inspecting and testing concrete; masonry and mortar; stucco; floors, walks, and driveways; walls and tanks; posts and precast work; and references and texts.

An appendix contains specifications for concrete.

The theory and practice of modern framed structures.—Part II, Statically indeterminate structures and secondary stresses, J. B. JOHNSON, C. W. BRYAN, and F. E. TURNEAURE (*New York: John Wiley & Sons; London: Chapman & Hall, 1929, 10. ed., rev., pt. 2, pp. XVIII+590, figs. 346*).—This is part 2 of the

tenth edition of this handbook (E. S. R., 58, p. 375), revised and rewritten by Turneaure and W. S. Kinne. It deals with statically indeterminate structures and secondary stresses. It contains chapters on continuous girders, swing bridges, cantilever bridges, arch bridges, suspension bridges, miscellaneous problems in statically indeterminate structures, secondary stresses, and analysis of quadrangular frames and secondary stresses by the method of slope and deflection.

A text-book on roofs and bridges.—Part II, Graphic statics, M. Merriman and H. S. Jacoby, rev. by E. E. Ebling (*New York: John Wiley & Sons; London: Chapman & Hall, 1932, 5. ed., rev., pt. 2, pp. X+228, figs. [140]*).—This is part 2 of the fifth revised edition of this book. It deals with graphic statics and contains chapters on principles and methods, roof trusses, highway bridge trusses, railway girders and trusses, railway trusses with broken chords, miscellaneous structures, elastic deformation of trusses, influence lines for stresses, and deflection influence lines.

Public Roads, [July, 1932] (*U. S. Dept. Agr., Public Roads, 13 (1932), No. 5, pp. 73–88+[2], figs. 14*).—This number of this periodical contains the current status of Federal-aid road construction as of June 30, 1932, and an article on The Design of Street and Highway Intersections, by L. S. Tuttle and E. H. Holmes.

The use of electricity in horticulture, C. A. C. Brown (*Jour. Min. Agr. [Gt. Brit.], 38 (1931), No. 2, pp. 132–137*).—In a contribution from the Institute of Agricultural Engineering of the University of Oxford, a survey is presented of the main applications of electricity to horticultural and allied work, including power for cultivation and heat and light for the stimulation and control of plant growth.

The conclusion is that the use of electricity in horticulture is in its infancy. Electricity to supply bottom heat appears to have the best chance of commercial use; in fact, the electric hotbed is now being used on the Continent.

The use of power for cultivation and electric light for stimulating growth are in a rather different stage of development. Cultivating sets are in existence and work well, but do not appear as yet to produce an economic return for the capital cost involved. Lighting produces pronounced effects on plant growth, but here again there is no evidence that the results justify the expenditure. More experimenting is required.

Adjustment of automotive carburetors for economy, S. H. Graf and G. W. Gleeson (*Oreg. Agr. Col., Engin. Expt. Sta. Circ. 2 (1930), pp. 40, figs. 16*).—This publication points out some of the factors that affect the economical operation of automotive engines, and presents data in support of a more scientific method of carburetor adjustment by the application of the analyses of the exhaust gases and the use of such analyses as a criterion of the economy of operation of an internal-combustion engine.

The studies indicate an average possible saving of motor fuel of 27.7 per cent for passenger cars and 22.3 per cent for trucks as the result of proper carburetor adjustment. The figures as calculated from the principles of combustion of the constituents of a motor fuel agree very closely with the figures obtained under conditions of maximum economy.

The method of procedure for exhaust-gas analysis and carburetor adjustment is described, as well as the instruments used in this connection. The road-test procedure as carried on in the study also is described, and the method of making carburetor adjustments by the use of the analysis of the exhaust gases is given.

The danger of poisoning from carbon monoxide is treated briefly.

The effect of humidity on engine power at altitude, D. B. Brooks and E. A. Garlock (*Natl. Advisory Com. Aeronaut.* [*U. S.*] *Rpt. 426* (*1932*), *pp. 9, figs. 5*).—Tests conducted at the U. S. Department of Commerce, Bureau of Standards, are reported in which it was found that the action of humidity on engine performance is not affected by change of air pressure or air temperature. The effect of humidity is to decrease engine indicated power in proportion to the concomitant decrease of dry-air pressure. The maximum obtainable indicated power of an engine under any conditions is directly proportional to its mass rate of consumption of oxygen under these conditions. Over the range covered by these tests the dry-air-fuel ratio for maximum power is invariant with altitude.

An appendix gives correlation coefficients.

Plowing with moldboard plows, W. Ashby and A. H. Glaves (*U. S. Dept. Agr., Farmers' Bul. 1690* (*1932*), *pp. II+22, figs. 16*).—This is based upon studies of plowing conducted jointly by the Bureau of Agricultural Engineering and the Plant Quarantine and Control Administration in cooperation with the Bureau of Entomology. Its purpose is to present information which will aid in keeping moldboard plows in good working condition, in using them most effectively, and in selecting new equipment to replace old.

Progress report on draft of plows used for corn borer control, W. Ashby, I. F. Reed, and A. H. Glaves (*U. S. Dept. Agr., Bur. Agr. Engin., 1932, pp. 23+* [*7*], *figs. 11*).—A series of plow draft tests is described the purpose of which was to develop methods for more conclusive studies (E. S. R., 63, p. 581).

Draft records of 25 plows were obtained in the fall of 1928. An oil-cylinder type of recording dynamometer and medium-weight wheel tractors with spade lngs were used, and records were made at both 6- and 8-in. depths. Each plow at each round crossed plats which had been single disked, double disked, and rolled with the cultipacker, as well as one to which no treatment had been given. The corn had been picked with a tractor-drawn mechanical corn picker. Usable draft records were secured for 22 plows at 6-in. depth and for 21 at 8-in. depth. The average distance traveled in making each record was about 2,000 ft. Ten plows were tested at 6-in. depth at two rates of travel, 2.5 and 3.25 miles per hour. In all tests the plows were equipped with standard rolling colters, jointers, and covering wires.

During June and July, 1931, a group of 158 variable speed draft tests were run in a clay loam soil. The field was last plowed during the spring of 1927. No crop was put in that season or since.

A number of comparative tests to obtain information about the effect of plow attachments on the draft; relative draft of 1-, 2-, and 3-bottom plows; draft of plows of various sizes; and effects of disking, double disking, etc., on draft were made in the spring of 1928 on sandy loam and clay loam soils using an Iowa integrating dynamometer. These tests were made in cornfields from which the stalks had been removed, leaving 8-in. stubble.

It was found that a close relationship exists between soil moisture and plow draft. The data indicate the great importance of plowing when soil conditions are right and suggest how quickly these conditions may become unfavorable after rains. It appears from the data presented that reduction in draft within the moisture range represented by these tests—probably 15 to 25 per cent—takes place as the result of the loosening of the moisture films rather than from changes in friction.

It seems clear that working clay loam soils with tractor-drawn implements, when damp or moist, causes a net increase in draft, though this did not appear to be the case in the field that was worked when dry. After making allowance

for side draft and weight of plow, it seems probable that at least half of the differences in draft are due to packing of the soil by the tractor.

The data also show that an increase in weight of plow from 3 lbs. per square inch of furrow slice to 5 lbs. per square inch increased the draft by 3.5 per cent; or, based on the average draft in this field, the draft due to weight alone increased at the rate of 0.185 lb. per pound of total weight, which is relatively small. A rear wheel giving full support reduced the draft about 7 per cent as compared with a similar plow having no rear wheel.

No general tendencies in shape of points were found to satisfactorily explain variations in the draft. There appeared to be a well-marked relationship between draft and the slope of moldboard at the mid-section, those plows having the steeper slope in proportion to their size showing the heavier drafts. There was no conclusive evidence as to other factors that influence draft. The analysis does not show that size of plow bottom has much effect on draft. However, the data are complicated by the use of colters and jointers on the plows.

The studies of the effect of 6- and 8-in. depths of plowing on draft showed that soil resistance was slightly higher at the end of the field where the 6-in. tests were made. The 18-in. plows were slightly more efficient for deep plowing than the 16- or 14-in. plows. The data also indicate that under uniform soil conditions an increase of 33 per cent in depth (from 6 to 8 in.) resulted in an increase in draft of only 14 or 16 per cent.

In the tests of the effect of speeds of 2.5 and 3.25 miles per hour on draft it was found that the average draft of the whole group showed an increase of 8.6 per cent at the higher speed, and the average of the 14-in. group showed a 10.6 per cent increase. The average increase in draft with the two bottoms used was 1.17 lbs. per square inch of furrow slice for each mile per hour increase in speed.

The use of two 10-ft. covering wires increased the draft about 2 per cent. Other tests indicated that three wires pull very little harder than two, since they usually wrap together and pull through the soil as a unit. It appears that the ordinary jointer used for corn borer control absorbs about 7 per cent of the power when used with the colter, and that the use of the jointer alone requires less power than the colter and jointer together. It seems probable that colter, jointer, and wires together absorb between 10 and 15 per cent of the total power.

The header barge method of harvesting, J. M. Smith and D. Cameron (*Alberta Univ., Col. Agr. Circ. 14 (1932), pp. 14, figs. 6*).—The purpose of this circular is to provide plans and the necessary details for building and operating a header barge.

The header barge method of harvesting consists of elevating the headed grain into a large box or barge which is pulled alongside or behind the binder or header. The barge is usually about 8 by 8 by 7 ft. and is mounted on two wheels so as to balance near the center. The headed grain is tramped in the barge by a stacker, and when the barge is full the stack is unloaded by opening the rear doors and sliding the stack out. When properly handled, this method is more economical than the binder and thresher method, because there is a saving of twine, labor, and shattering of grain. The grain is usually of high quality, as shrinkage and bleaching are greatly reduced and the color is improved by sweating. With a 12-ft. header or a 10-ft. power binder two men can harvest from 25 to 35 acres per day.

The hazards of the method have been found to be the danger of spoilage in the stack and the danger of heating caused by green weeds and not fully ripe grain.

AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY

Conference on economic policy for American agriculture, edited by E. A. DUDDY (*Chicago: Univ. Chicago Press, 1932, pp. XI+150, figs. 8*).—Included are the following papers presented at the conference, held at Chicago, Ill., September 7–9, 1931: The Problem of Determining an Economic Policy for American Agriculture, by J. D. Black (pp. 1–19); The Foreign Situation as Conditioning American Agricultural Policy, by E. G. Nourse (pp. 20–27); The Problems of Land Utilization, by L. C. Gray (pp. 28–40); Taxation in Relation to Land Utilization, by B. H. Hibbard (pp. 41–51); American Agricultural Policy in Relation to Population Growth, Urban-Rural Balance, and Consumption Trends, by O. E. Baker (pp. 52–69); Shifting Elasticities of Demand for Farm Products, by H. Schultz (pp. 70, 71); Standard of Living as an Objective of Agricultural Economic Policy, by C. C. Taylor (pp. 72–92); Economic Policy and the New Proprietorship in Agriculture, by C. L. Holmes (pp. 93–111); Money and Credit in Relation to Agricultural Prices, by H. A. Wallace (pp. 112–121); The Formulation of an Economic Policy for Agriculture, by J. S. Davis (pp. 122–132); and Regional Planning for Agriculture, by H. R. Tolley (pp. 133–150).

[Investigations in agricultural economics at the Texas Station, 1931] (*Texas Sta. Rpt. 1931, pp. 73–79*).—Among the results not previously noted are preliminary findings of a study by C. A. Bonnen, made in cooperation with the Bureau of Agricultural Economics, U. S. D. A., in 1931, of the organization and management of farms in the High Plains cotton area of the State; a table by L. P. Gabbard and W. E. Paulson showing the average grades and staple lengths of cotton sold and prices received at 5 local cotton markets during the season 1930–31 and the average central market prices; a summary by Paulson of the average mixed car-lot movements of fruits and vegetables from the lower Rio Grande Valley in 1930–1931 as compared with former periods of years; and a table by Gabbard showing the ratio of total taxes to net income on rented farms in 7 counties, by years 1924–1930.

[Investigations in agricultural economics at the Wisconsin Station, 1930–31] (*Wisconsin Sta. Bul. 421 (1932), pp. 6–18, figs. 2*).—Results of investigations not previously noted are reported on as follows:

Tables with explanatory text are given by C. F. Wehrwein and B. H. Hibbard showing for 20 counties the total expenditures for roads, by years 1926–1930, by civil towns, counties, and the State, and for different classes of roads, and the percentage of the different expenditures secured from different tax sources in 1930.

A brief summary is given of facts brought out by a survey of the dairy situation in 4 counties, made by R. K. Froker, H. H. Bakken, and A. C. Hoffman.

A table by Bakken and W. V. Price shows the average volume of milk per factory, butterfat test and price paid per pound of butterfat, cheese yield per pound of butterfat, sales price and gross manufacturing expense per pound of cheese, price paid per 100 lbs. of milk, and value of whey cream per 100 lbs. of milk.

Tables with explanatory notes are given by P. E. McNall and D. R. Mitchell showing the average crop acres and milking cows per farm and the average man labor required per year for livestock and crop production and miscellaneous work on 65 farms in 3 counties, and the hours per cow required for different purposes on farms with and without milking machines.

An economic study of crop production in the Red River Valley of Minnesota, G. A. POND, G. A. SALLEE, and C. W. CRICKMAN (*Minnesota Sta. Bul.*

282 (1931), pp. 110, figs. 39).—This is the first of a series of three bulletins based on a study made in 1926–1928 in cooperation with the Bureau of Agricultural Economics, U. S. D. A. In addition to general observations and analysis of current statistical information, a detailed study was made of the organization and operation of a group of representative farms in Polk County, using the complete cost route method previously described (E. S. R., 50, p. 889; 52, p. 490).

The physical and climatic conditions of the valley, its adaptation to crops, crop yields, and the transportation facilities, markets, and agricultural development are described. The cropping problems, the usual practices in the growing of different crops, and the relations between crops are discussed.

Analysis is made of the monthly distribution of man labor and the distribution, by operations in 1927, of man labor and horse and tractor work and the materials used in growing and harvesting different crops on the farms studied. Tables are given showing the standard equipment and man labor and horse and tractor requirements for different growing and harvesting operations for the several crops. The total and seasonal demands for labor and equipment and the cash value and feeding value returns of different crops are compared, and suggestions are made for cropping systems.

An economic study of livestock possibilities in the Red River Valley of Minnesota, G. A. Sallee, G. A. Pond, and C. W. Crickman (*Minnesota Sta. Bul. 283 (1931), pp. 58, figs. 24*).—This is the second bulletin of the series noted above. The development of livestock enterprises, the reasons for the present systems, the pasture and feed crops as a basis for livestock production, and the different livestock enterprises are described or discussed. The variations in the amounts of feed fed, man labor, horse work, materials used, and production in 1927 per dairy cow, per head of young dairy cattle, per 100 lbs. of hogs, per 100 chickens, and per work horse on the several farms are presented in tables and discussed. Charts showing the labor distribution, and tables showing standards of feed, man labor, horse work, and cash costs are included. The advantage, place, present status, and possibilities and limitations of expanding the different livestock enterprises in the farm organization of the valley are discussed. Livestock organizations are suggested for a 224-acre, a 400-acre, and a 547-acre farm.

Planning systems of farming for the Red River Valley of Minnesota, G. A. Pond, G. A. Sallee, and C. W. Crickman (*Minnesota Sta. Bul. 284 (1931), pp. 84, figs. 18*).—This is the third of the series noted above. It discusses the problems making necessary adjustments in the present farming systems and the methods of using basic farm organization data in planning and testing adjustments on individual farms. Long-time systems of farming are outlined for three selected farms of 224, 400, and 617 acres, respectively. Tables and charts are given showing the distribution of labor, production, returns, expenses, etc., under the present organization and the suggested organization. Budgets are also given for the 240-acre farm group with different prices for different products.

The Winter Garden region of Texas, E. Mortensen (*Texas Sta. Circ. 62 (1932), pp. 32, figs. 6*).—The topography, soils, water resources, and climate of, the types of farming in, and the vegetables, vegetable plants, fruits and nuts, field crops, and ornamental crops produced in the 10 counties of southwestern Texas known as the Winter Garden are described.

Economic utilization of land for pasture in southern Indiana, G. E. Young (*Indiana Sta. Bul. 359 (1932), pp. 24, figs. 10*).—The results are reported of a study made in Washington County based on records for 1927 and 1928 of

kinds, costs, and carrying capacity of pastures, and production and farm financial records, together with some dairy production records for 1929 and 1930. The area, its utilization for crops and livestock, and the kinds of pastures used are described. Analysis is made of the carrying capacity and cost of Washington County pastures. The problems of the utilization of low-grade pastures, the distribution of pasture land, the economic changes affecting the importance of crops and pasture in the State, and the needs for and factors affecting adjustments in land utilization in the southern part of the State are discussed.

Approximately two-thirds of all pasture land in Washington County was used for dairy cattle, 6 per cent for beef cattle, and 10 per cent each for sheep, hogs, and horses. In 1929 pasture furnished feed at 25 per cent of the cost of other feed. Rotation pasture occupied 44 per cent of the total pasture acreage and produced 50 per cent of the total pasturage. Pastures used by dairy cattle produced about 50 per cent as much actual feed per acre as the ordinary yield of corn or legume hay on similar land. Farms with 50 per cent of the farmed area in pasture tended to be more profitable than those with only 25 per cent of such area in pasture. An average of 3.4 acres of pasture was required per animal unit for a pasture season of 180 days. The average cost of maintenance was $3.13 per acre.

Forest land use in Wisconsin, R. B. Goodman et al. (*Madison: State, 1932, pp. [7]+156, pl. 1, figs. 25*).—This is the report to the Governor of Wisconsin of the Committee on Land Use and Forestry. The ownership and use of lands; the forest cover; use of land for agriculture, including farm abandonment and agricultural adjustments; the forest industries; present and possible use of lands for forests, including the trends in land ownership; forest management; forest taxation; public administration of lands, forests, and water resources; and the essentials of a land use program are discussed. A bibliography, compiled by M. M. Kirsch, is included.

Recreation as a land use, G. S. Wehrwein and K. H. Parsons (*Wisconsin Sta. Bul. 422 (1932), pp. 32, figs. 6*).—This bulletin discusses in a popular way the need for recreational land, the present areas in Wisconsin devoted to such use, and the opportunities for the extension of such areas. Data are included regarding the various classes of recreational land and other lands and tax delinquency in Oneida, Vilas, and Forest Counties, Wis.

Factors related to income and costs of production on farms in Marshall and DeKalb Counties, Alabama, 1927–1929, C. G. Garman (*Alabama Sta. Bul. 236 (1932), pp. 56, figs. 4*).—This bulletin reports the results of a study made to determine the factors associated with higher incomes from farming in the Appalachian Plateau region of Alabama. Labor income records were obtained from an average of 29 commercial poultry farms—farms deriving considerable income from poultry in addition to cotton, the principal source of income—and from an average of 79 farms having only small farm flocks of poultry. Supplementary information regarding fertilizer practices and labor on the principal crops was also obtained on the commercial poultry farms. The area, tenure of farmers, and the conditions existing during the three years are described. Tables are included showing for the two types of farms the average acreage yields of different crops, number and value of different kinds of livestock, operator's capital, receipts and expenses, quantity and value of home-grown products used, and labor incomes. Analysis is made of the relation of acreage of cotton, number of chickens, yield of cotton per acre, egg production per bird, and diversification of the farm business to labor income.

Analysis is also made (1) for cotton, 1928 and 1929, of the man labor and mule work required with 1- and 2-horse cultivators, the costs and returns per

acre, and the relations of yield and cost of production to labor income and of amounts of fertilizer and manure and value of land to cost of production; (2) for poultry, 1927–1929, of labor requirements, receipts and expenditures for commercial and small farm flocks, and the relations of average number of layers and of number of eggs per layer during the year and the 5 months, September to January, inclusive, to cost of producing eggs and the return for labor, and for 1928 and 1929 the costs of hatching chickens and raising pullets; (3) for corn, 1928 and 1929, the man labor and mule work per acre required for different operations with 1- and 2-horse equipment, the costs by items, and the relations of yield and of cost of fertilizer per acre to cost of production and of man hours used in cultivating to yield and cost of production; (4) for soybean hay, 1928 and 1929, the man labor and mule work requirements per acre, costs by items, and returns per acre; and (5) the distribution in 1929 of man labor and mule work, by months, on the principal crops and commercial poultry flocks.

Some of the findings were that the commercial poultry farms averaged 32.7 acres in crops, of which 15.4 acres were in cotton. The small flock farms averaged 33.6 acres, of which 18.7 acres were in cotton. Average labor incomes were relatively much more stable on the commercial poultry farms. On the small flock farms, average labor incomes increased with an increase in acreage in cotton or an average yield of lint per acre. The farms above the average in acres of cotton, yield of lint per acre, and acres of cotton per mule had an average labor income of $870, as compared with $45 for the farms below the average in the three factors. On the commercial poultry farms the average labor income increased with an increase in the number of chickens or in egg production per bird.

Operators receiving $50 and more from miscellaneous sources had higher average labor incomes. Yield of cotton per acre and return per acre increased with increased applications of fertilizer.

Farmers using 2-horse cultivators for some cultivation operations spent 16.5 man hours less per acre on cotton and 6.5 hours less on corn than did those using 1-horse cultivators for all operations. The average costs of production for 1928 and 1929 were, for cotton, $45 per acre or 10 cts. per pound; corn, $20 per acre or 76 cts. per bushel; unbaled soybean hay, $19 per acre or $24 per ton; baby chicks, 7.6 cts. each; and pullets, 89 cts. each. The average cost of eggs for the 3 years was 24.3 cts. per dozen.

The average returns per hour of man labor in 1928 and 1929 were, for cotton and corn, 42 cts., and for soybean hay, 27 cts. For the 3 years the average return was 43 cts. per hour of man labor for commercial laying flocks. Averages of 112 man and 50 mule hours per acre were spent on cotton, 40 man and 38 mule hours on corn, and 30 man and 31 mule hours on soybean hay. An average of 575 hours of man labor, 40 per cent of which was furnished by the operator's wife and children, was spent on commercial poultry flocks, and 178 hours, of which 88 per cent was furnished by the wife and children, on the small farm flocks.

Commercial poultry flocks producing 160 eggs or more per layer returned more than 2.5 times as much per hour of labor as did those producing 70 to 129 eggs per layer. Commercial flocks with a production of 35 or more eggs per layer during September to January showed a higher annual production, a lower average cost per dozen, and a higher average price per dozen for eggs than did flocks with lower production during the 5 months.

Costs and utilization of corn in seven Iowa counties, H. L. Thomas and J. A. Hopkins, Jr. (*Iowa Sta. Bul. 289 (1932), pp. 32, figs. 14*).—The primary data for this publication were obtained from detailed crop and labor records

for 1927 and 1928 kept on about 25 farms in each of 5 counties representative of the main type-of-farming areas of the State, supplemented by cost route data for 1925–1927 from Iowa County and for 1928–1930 from Webster County. Tables and charts are included and discussed showing the place of corn in the cropping systems of the several counties, the effects on yield of depth of plowing and planting and number of diskings and harrowings, listing v. checking, number of cultivations, different cultural sequences, the seasonal distribution of labor, variations in labor requirements in growing and picking corn, the costs of production, and the effect of changes in prices on costs. Analysis is made of the relationships between the amount of corn produced and net farm income, value of hog and cattle increases, and returns per $100 worth of feed fed, and between total acreage of corn and total farm expense with different types of farming and labor requirements.

The number of man hours required to grow an acre of corn ranged from 5 to 10 hours and that to pick an acre from 5 to 8 hours in the 7 counties. Operating costs per acre varied from $11 or $12 to $19 or $20, and the average cost per bushel from 40 to 77 cts. With an average production of 2,000 bu., the net income per farm was about $4,300, and with 6,000 bu. about $5,000.

Why corn costs vary, H. L. Thomas and J. A. Hopkins, jr. (*Iowa Sta. Bul. 289a (1932), pp. 4*).—An abridgement of the bulletin noted above.

Making cotton cheaper: Can present production costs be reduced? M. G. Vaiden, J. O. Smith, and W. E. Ayres (*Mississippi Sta. Bul. 298 (1932), pp. 16, figs. 11*).—This bulletin supplements the bulletin previously noted (E. S. R., 65, p. 187). Tables and charts are included and discussed showing the cropping systems and detailed costs per acre in 1931 of raising cotton on 2 plantations with quarter hands and 3 with half hands and on 5 tractor-operated plantations. Comparisons are made between the 1931 costs and the costs in 1930 on the different types of plantations. Another table shows the cultivation costs per acre, by items, for 1931, the average for 1929–1930, and the average for 1929–1931 at the Delta Substation using 1-horse, 2-horse, 2-row tractor, and 4-row tractor equipment.

The average total costs per acre in 1931 were $52.93 on the quarter-hand plantations, $42.21 on the half-hand plantations, and $29.37 on the tractor-operated plantations. The costs of tenant operations on the 5 tenant-operated plantations averaged $20.01 per acre in 1931 as compared with $30 in 1930, and total production costs $46.49 as compared with $60.56. The average cultivation costs per acre, 1929–1931, at the Delta Substation with different types of equipment were for 1-horse $11.53, 2-horse walking cultivator $9.26, 2-horse riding cultivator $8.78, 4-horse $7.38, 2-row tractor (1929–1930), $6.62, and 4-row tractor $4.71.

Some of the conclusions of the authors are that (1) the 15-acre-per-family units can never again on the average be profitable even in the Delta area, (2) part of the power now supplied by man must be replaced by mules and machines, (3) from 30 to 50 per cent of the present farm labor must be replaced by machinery if plantations are to escape foreclosure, (4) putting labor on a cash or day basis will increase its efficiency 50 to 100 per cent, and (5) mechanical harvesting equipment can reduce operating labor 75 per cent from that with 1-mule method requirements.

Economics of sheep production in western New Mexico, A. L. Walker, J. L. Lantow, and K. P. Pickrell (*New Mexico Sta. Bul. 204 (1932), pp. 61, figs. 11*).—This report of a study made in cooperation with the U. S. D. A. Bureau of Agricultural Economics is based on data gathered from 16 ranches each for the years 1927–1929. Only 12 of the ranches were included each year.

The cyclical movements, 1900–1930, of number of sheep on farms and ranches, of receipts of sheep at 9 principal markets, of prices of sheep and of lambs, and of purchasing power of lambs and wool, the importance of the sheep industry in New Mexico, the areas in which the cooperating ranches were located, the practices of operation and the organization of sheep ranches in western New Mexico, the use of land, and interest costs are described and discussed. Analysis is made of the relations between ranch income and percentage of lamb crop, percentage of death loss, value of lamb crop produced, value of wool crop produced, and the ratio of receipts to expenses. The average results for the 12 ranches and for the 6 highest and the 6 lowest ranch income per head ranches are compared. Analysis is made also of the average annual cost per ranch and per ewe of carrying a breeding herd and of the cost of producing lambs and wool. Comparison is made of average ranch investment, receipts, expenses, and income and the average cost per ranch and per ewe of carrying a breeding herd and of producing lambs and wool on 5 of the ranches in 1927–1929 and in 1931.

The ranches studied in 1927–1929 averaged over 4,100 sheep, of which 3,330 were breeding ewes. Investment per ranch averaged slightly over $110,000, or $26.57 per head of sheep run, of which 62.6 per cent was investment in land. Receipts averaged $6.54 per head, expenses $4.04, and income $2.50, leaving 38 cts. per head as the amount earned by the operators for labor and management after deducting interest on investment. Operators owned 7 acres of land per head of sheep run, leased 9.8 acres, and had 2.4 acres on national forest permits.

The average ranch income per head on the 6 highest income per head ranches was $3.36, as compared with $1.64 on the 6 lowest income per head ranches. The averages for different factors affecting ranch income for the highest income and the lowest income per head ranches are shown in the following table:

Factors affecting ranch income in New Mexico

	Highest income per head ranches	Lowest income per head ranches
Receipts per head	$7.36	$5.99
Expenses per head	4.00	4.35
Ranch income per head	3.36	1.64
Lamb crop at marketing ... per cent	79.1	69.2
Value of lamb crop per head	$4.97	$4.50
Value of wool crop per head	2.16	1.78
Death loss ... per cent	4.6	9.2
Returns per $1 expended	$1.84	$1.38

The average annual cost of carrying a breeding herd during the 3 years was $9.48 per breeding ewe. The average cost of producing lambs up to time of marketing was $8.91 per head and that for wool 28.5 cts. per pound.

A detailed description of the vegetative associations in the area is appended (pp. 50, 51).

Preliminary report on economic factors affecting the production and marketing of poultry products in Utah, October 1, 1928, to September 30, 1929, W. P. Thomas and M. Clawson (*Utah Sta. Misc. Pub. 8 (1931), pp. 24, figs. 3*).—This is the first preliminary report of a proposed 3-year study made in cooperation with the Bureau of Agricultural Economics, U. S. D. A. It is based on data secured for the year ended September, 1929, from 119

commercial poultry producers located in 10 counties of the State. Tables are included showing for the flocks grouped by the number of hens (0–500, 501–1,000, 1,001–1,500, and over 1,500) the acreage in farms and under cultivation, capital investment by items, indebtedness, source of income by items, farm income, expenses by items, operator's labor and management wage, egg production costs and returns per dozen eggs and per hen, and the costs of raising pullets. Other tables and charts show the average net cash prices received for eggs, October, 1924, to July, 1930; index numbers, January, 1910, to April, 1931, of prices paid Utah producers for eggs; percentage of eggs of different grades sold by Utah producers, October 1, 1928, to September 30, 1929; and the average value of products furnished by the farms studied for family use, October 1, 1928, to September 30, 1929.

Second preliminary report [on] economic factors affecting the production and marketing of poultry products in Utah, October 1, 1929, to September 30, 1930, W. P. Thomas and M. Clawson (*Utah Sta. Misc. Pub. 9 (1932), pp. 24, figs. 5; abs. in Utah Sta. Circ. 100 (1932), p. 11*).—This is the preliminary report for the second year of the cooperative study noted above. Data were obtained from 100 commercial poultry producers in 8 counties. Tables are included showing for the flocks grouped as to size the feed, overhead, labor, depreciation, and other expenses, the total and net returns, and the man labor requirements per hen of the laying flocks and per pullet raised. Other tables and charts show for the year 1929–30 the egg production costs, by items, per farm, per hen, and per dozen; the average investment per farm and per hen; the quantity and value of feed per hen; and the costs, by items, of raising pullets. Comparisons are made of the costs and returns per hen and per dozen eggs, egg production by months, and the factors affecting net returns per hen for the 33 most profitable and the 33 least profitable flocks in 1929–30. Other tables and charts make comparisons of the 1928–29 and 1929–30 findings and of feed costs and monthly prices of different grades of eggs for each of the two years and also for 1930–31.

Statistics of livestock marketing and livestock trucking in Iowa in 1931, D. A. FitzGerald (*Iowa Sta. Circ. 136 (1932), pp. 16*).—Tables are included showing for swine, cattle and calves, and sheep and lambs the number marketed at public stockyards, the number shipped direct to Iowa packing plants, and the number shipped to other packing plants, by years 1920–1931, and by months 1931; the number of animals trucked to markets, the percentage of those going to public stockyards, packing plants, and concentration points (hogs, 1924–1931, and cattle, calves, and sheep, 1929–1931); the number of stocker and feeder cattle and sheep and lambs shipped into Iowa from public stockyards, 1920–1931, and 1930 and 1931 by months; the changes in the annual pig crops and the packing year hog marketings; the relation between the semiannual pig surveys for Iowa and actual farrowings, 1922–1932; and beef steer receipts at Chicago, total and from Iowa, by grades, 1929, 1930, and 1931.

Types of hogs marketed and consumer demand in Oregon, H. A. Lindgren, A. W. Oliver, and E. L. Potter (*Oregon Sta. Bul. 297 (1932), pp. 14, figs. 5*).—Included are the results of a study made of the types of hogs received and prices paid for different types on the Portland, Albany, and Salem livestock markets.

The desirable hog under present conditions was found to be one weighing from 160 to 200 lbs. with a hard finish and free from excessive lardiness. Such hogs constituted 64 per cent of the receipts at the Portland market and 42 per cent at the other markets. Lardy hogs constituted 18.3 and 36.9 per cent, respec-

tively. Prices for hogs weighing over 200 lbs. were from 50 cts. to $1 less per 100 lbs. than those for more desirable hogs. Thin hogs brought from 60 cts. to $1 less than more desirable hogs. Production of 200- to 225-lb. hogs was found to be justified when the price per 100 lbs. equaled the cost of 690 lbs. of grain. The daily gain for 200 lbs. and over hogs was greater, but the cost per pound was also greater than that for lighter hogs.

Results of feeding experiments with chunky and heavy types of hogs are noted on page 728.

Factors affecting shrinkage in shipping hogs by rail, J. R. Wiley (*Indiana Sta. Bul. 358 (1932), pp. 30, figs. 11*).—This study is based on data regarding (1) shipments to the Indianapolis market during 1925–1929 and covers 553,279 hogs arriving in straight, mixed, and double-deck carloads; and (2) 4,884 straight and 1,323 mixed single-deck carloads of hogs shipped to Indianapolis and Chicago during 1927 and 1928, on the former of which range in temperature and maximum temperature, distance to market, and number of hogs per car were obtained. Shrinkage was calculated by using the weights at the local railroad loading points and the weights at which sales were made to buyers at the central markets. Tables and charts are included and discussed showing, by months for each year from January, 1925, to December, 1929, inclusive, the average percentages of shrinkage for all shipments, for shipments from Indiana and from Illinois, and for straight carloads; and the relation (average and computed trends) to percentage of shrinkage of range in temperature and maximum temperature during transit, of distance to market, of total weight per car, and of average weight per hog. Other charts compare the percentages of shrinkage in summer and winter as affected by average distance to market and weight per car and in straight and mixed carload shipments.

The study shows that (1) the average monthly shrinkage in the same months varied widely from year to year, especially in the spring, summer, and early fall months, and (2) the average monthly percentage of shrinkage increased from 1.66 and 1.68 in January and February, respectively, to 1.89 in March and 2.19 in April, remained about constant (2.17 to 2.29) through May, June, July, and August, rose to 2.56 and 2.59 in September and October, respectively, and then decreased to 2.23 and 1.84 in November and December, respectively. Range in temperature had little, if any, influence on shrinkage. Shrinkage increased as the maximum temperature increased above or decreased below about 15 to 20° F. Increase in distance to market increased shrinkage, but the relationship was erratic, showing effects of other factors such as shipping practices. Shrinkage increased quite uniformly with total weight in car, except for 36-ft. cars loaded with less than 12,250 lbs., for which shrinkage decreased with increase in load. Average weight of hogs showed no definite relation to shrinkage. Mixed carloads showed higher shrinkage than straight carloads.

Cooperative shipping of eggs in Indiana, E. R. Menefee (*Indiana Sta. Bul. 357 (1932), pp. 30, figs. 11*).—Analysis from the standpoint of results and factors influencing the success is made of the following plan of cooperative shipping of eggs: The farmer grades and packs his eggs in standard cases, tags the cases for his selected New York City receiver, and delivers them direct to the car. The cases are loaded in refrigerator cars under the supervision of the manager, who collects the cost of freight and expense of loading. Shipments are made by fast freight and delivered to the designated consignees (10 to 20 per car) by bonded truckers. The consignees draw samples, determine the price to be paid and mail checks direct to the individual shippers, and report the number of cases consigned by each farmer and the prices paid to the manager.

Tables and charts are included and discussed showing (1) for each of five associations the number of cases, gross receipts, cost of shipping, net return,

value of eggs on local market, and gain by shipping, and for one association, active since 1928, the number of eggs shipped, by months, March, 1928, to October, 1930, inclusive; (2) summary of prices received per dozen, value of eggs in New York City, costs of shipping, gains in value of eggs over local prices, and saving due to the use of freight rather than express on individual shipments and for each shipment during 1929; and (3) the increased net returns, 1928, 1929, and 1930, total and by months, due to the use of freight rather than express and to higher prices in New York City than in local markets.

Other tables show for the one association data as to the breeds of chickens, size of flocks, relation of distance from shipping point to number of chickens and size of flocks, causes of farmers missing shipments, volume and percentage of eggs selling at quotations for different New York City market grades, percentage of U. S. special grade eggs delivered by 25 farmers, and the correlation between such percentages and prices received in New York City. The organization and operation of an association and some of the factors essential for success are discussed.

Shipments by freight were 97 cts. per case less than by express. The total net gain over value on the home market of the 160,719 cases shipped by the five associations was $253,100. The volume of high quality eggs shipped is largely responsible for the success of the associations. Prices received by producers have usually been near the top prices of the New York market. Prices based on quality have been an incentive to ship clean, full-bodied, sound eggs of good size.

Report of a survey of graded egg buying in Iowa, W. D. TERMOHLEN (*Iowa Sta. Circ. 135 (1932), pp. 16, figs. 3*).—Tables and maps are included showing, by years 1917–1931, the number of agencies buying eggs on grade, the location of dealers buying on grade in 1931, the number of grades used by different types of buyers, grade names used, and the percentage of different types of dealers buying on grade only and on grade or straight. The variations in grade descriptions, the number of grades recommended by different types of buyers, the attitude of different types of buyers toward a grading law, and the weaknesses of grading in the State are discussed. Some suggestions are made for improving the buying on a grade program.

In 1931, of the licensed egg buyers 8.4 per cent bought on grade, but 40.1 per cent of these bought only partly. Of carload shippers equipped with refrigeration, 85.2 per cent bought on grade. Of the 629 dealers buying on grade, 65.82 per cent used the 2-way grade, 27.03 per cent the 3-way grade, and 6.5 per cent the 4-way grade. Fifty groups of names were used by 281 firms to designate grades. Of the dealers making recommendations or suggestions, 60.6 per cent favored buying on the 2-way grade and 31.7 per cent on the 3-way grade. A grading law was favored by 84.6 per cent.

The quality factor in the marketing of milk, R. S. BREED (*New York State Sta. Circ. 131 (1932), pp. 7*).—This is an address discussing milk grading and the application of grading principles under present conditions in the New York milk shed, delivered at Farm and Home Week, Ithaca, N. Y., February 18, 1932.

Causes of damage to fruits and vegetables during shipment, J. W. LLOYD and H. M. NEWELL (*Illinois Sta. Bul. 379 (1932), pp. 81–119, figs. 24*).—Observations on 249 carloads of fruits and vegetables at the Chicago terminal showed shifting of the load to be the major cause of damage, quite irrespective of the type of package. The factors involved in shifting were faulty loading and rough handling of the car. With respect to faulty loading, the authors discuss correct and incorrect methods of placing the packages in the car and point out

measures insuring against such loss. Improper loading is believed to result largely from a lack of knowledge of how to load, and it is suggested that schools of instruction might very well supplement the printed information now available. Losses could be further reduced by shipping only products of good carrying quality, the consistent use of refrigeration when needed, and prompt unloading upon arrival.

Crops and Markets, [July, 1932] (*U. S. Dept. Agr., Crops and Markets, 9 (1932), No. 7, pp. 225–272, figs. 3*).—Included are tables, reports, summaries, charts, etc., of the usual types.

Adequacy and reliability of crop-yield estimates, C. F. Sarle (*U. S. Dept. Agr., Tech. Bul. 311 (1932), pp. 138, figs. 2*).—"The primary purpose of this bulletin is to report the results of a critical investigation of the sources of current information, the character of the information received, and the methods used in preparing the official estimates of yield per acre of crops. This investigation has been conducted over a period of several years, has served as a basis for determining the reliability and adequacy of estimates of crop yields per acre, and has resulted in improvement and refinement of methods used in preparing such estimates.

"The procedure followed in the study was to examine the data regularly available to the Department of Agriculture in the light of statistical principles, related to sampling, that had been tried and proven in other fields. In the course of this examination the data basic to many of the official estimates for principal crops in related States were reworked, and accepted measures of reliability were applied. Official estimates were compared with the yields indicated by the reports received, considered alone without correction by the board."

The nature and sources of reports from farmers and the preparation of the estimates are described. The problem in making estimates, the representativeness of yield samples, methods of selecting a representative sample, the errors encountered and their treatment, the measures of precision of averages, and statistical induction are discussed. Critical analysis is made of the data for typical States and years for important crops. Comparison is made of the yield estimates of the Department and those derived from Bureau of the Census data. An appraisal is made of the series of estimates in use in the Department since 1866.

A number of suggestions are made as to ways in which the methods of making estimates for certain districts and crops could be improved, although as a whole the author finds that "the present method of collecting sample data from voluntary correspondents is generally successful as a basis for estimates of yields per acre in the case of most crops of extensive acreage in important producing States."

Rural sociology, R. H. Holmes (*New York and London: McGraw-Hill Book Co., 1932, pp. XIII+416*).—This textbook deals with the subject under the following chapter headings in addition to an introductory chapter discussing the field of rural sociology and the approach in social theory: Nature of the family-farm institution, the family-farm in an urban setting—influence upon individual attitudes, the farm and men of eminence, origins and development of the farming class of America, some economic aspects of American agriculture, the corporation farm, the standard of living, farm population (with special reference to the factor of migration), mental characteristics of agriculturalists, the farm home and family, the rural community, communication, the rural school, vocational education in agriculture, adult education, religion and the church, rural health, art and recreation, relations between agricultural and nonagricultural population, and progress.

A systematic source book in rural sociology, III, edited by P. A. SOROKIN, C. C. ZIMMERMAN, and C. J. GALPIN (*Minneapolis: Univ. Minn. Press, 1932, vol. 3, pp. XIII+752*).—This is the third and final volume of the source book previously noted (E. S. R., 64, p. 577; 65, p. 687). It presents an analysis of rural populations and rural-urban relationships. Part 4 deals with the physical, vital, and psycho-social traits of farmers and peasants in chapters on physical traits of the rural and urban populations, comparisons of the health and the vital processes of the two populations, and on rural-urban intelligence, mental health, psychological processes, and predominant attitudes. Part 5 deals with rural-urban social relationships in chapters on a comparison of farmer-peasants and other social classes, rural-urban migrations, and the fundamental functions of the city and the country in the life history of nations and of mankind.

[**Investigations in rural sociology at the Wisconsin Station, 1930–31**] (*Wisconsin Sta. Bul. 421 (1932), pp. 18–24, figs. 3*).—Based on a study by E. L. Kirkpatrick, P. E. McNall, and M. L. Cowles in cooperation with the Bureau of Agricultural Economics, U. S. D. A., charts and explanatory text are included showing, by counties, in 1929 the value of food, housing, and fuel furnished by the farm and purchased by 900 farm families in 7 counties representative of 6 major farming type areas of the State, and the cash income, cash paid for family living, value of family living furnished by the farm, and savings or deficits of the families grouped by cost of living.

Some conditions found in previous surveys of town and country relationships in Walworth County and of neighborhood and town-country relations in Dane County are compared with the conditions found by J. H. Kolb and R. Polson in resurveys made of these counties.

The effect of income on farm standards of living, E. A. WILLSON (*North Dakota Sta. Bul. 256 (1932), pp. 46, 47*).—The average receipts and expenditures and the percentages of total cash expenditures for different purposes, as shown by 154 records covering the years 1925–1929 and gathered in cooperation with the U. S. D. A. Bureau of Agricultural Economics, are discussed.

The co-operative movement in India, E. M. HOUGH (*London: P. S. King & Son, 1932, pp. XXVII+340, figs. 5*).—This study was part of the work of the author for the degree of doctor of philosophy from George Washington University, Washington, D. C. It discusses the geographic, social, economic, industrial, and political backgrounds of the present national economy of India, the history of the cooperative movement in India up to 1904, the legislative basis for and types and the growth and present status of cooperation in India, the handicaps and weaknesses of the system, the achievements, and the potential contribution of the Indian cooperative movement.

The introduction is by Sir Horace Plunkett and the foreword by H. L. Kaji.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Institutions engaged in agricultural education in the warm countries and large nations with colonies, A. BRIZI (*Institutions s'Occupant de l'Enseignement Agricole dans les Pays Chauds et les Grandes Nations Colonisatrices. Rome: Inst. Internatl. Agr., 1932, pp. 128, figs. 3*).—The institutions are listed with notes covering their organization, budgets, curricula, degrees conferred, etc.

The training of women for country life, A. M'CALLUM (*Scot. Jour. Agr., 14 (1931), No. 2, pp. 125–130, pls. 2*).—This is a brief description of the Craibstone (Scotland) School of Rural Domestic Science.

Organization and teaching procedure to be followed in evening agricultural schools on the marketing of vegetables, J. H. Pearson and H. C. Hensley (*Fed. Bd. Vocat. Ed. Monog. 14 (1932), pp. III+33*).—This publication was prepared in cooperation with the Federal Farm Board. Analysis of the job of marketing vegetables is made in a table showing the decisions to be made, factors to be considered, and information needed to apply factors. Suggestions on teaching procedure are made for each of the factors, with references to publications included in a list of books and of State, Federal, and other publications.

Organization and teaching procedure to be followed in evening agricultural schools on the marketing of wool and mohair, J. H. Pearson and J. M. Coon (*Fed. Bd. Vocat. Ed. Monog. 15 (1932), pp. III+11*).—This publication, prepared in cooperation with the Federal Farm Board, analyzes the job of marketing wool and mohair, following the same general form as in the bulletin noted above.

A study of the individual assignment versus the class method of instruction in a ninth-grade clothing class, I. I. Sell and C. M. Brown (*Jour. Home Econ., 24 (1932), No. 7, pp. 621–625*).—Comparison is made of the results in 2 ninth-grade clothing classes of 16 pupils each in the School of Agriculture of the University of Minnesota in 1929–30. One class was conducted using the usual method of class discussion and laboratory work and the other using individual assignments. The former excelled in each test used—unit, final objective, practical, construction work, weekly assignments, account books, and work accomplished.

FOODS—HUMAN NUTRITION

Chemistry of food and nutrition, H. C. Sherman (*New York: Macmillan Co., 1932, 4. ed., rewritten and enl., pp. XIII+614, figs. 32*).—Changes and additions in successive editions of this well-known text serve as a valuable index of the important developments in the chemistry of food and nutrition. Among the developments noted in comparing this edition with the previous one published six years ago (E. S. R., 55, p. 691) are the following:

Greater emphasis is placed on the classification of the fats and lipoids under the general heading lipids, and new material is reported on the effect of food upon body fat and on the lipids as body constituents. The dual function of nutritionally essential amino acids as building stones for tissue proteins and as precursors of hormones or nutrition catalysts is emphasized by including in the chapter on the nutritional chemistry of the proteins and their amino acids a section on the nutritional catalysts glutathione, thyroxine, adrenaline, and insulin.

The acid-base balance in foods and nutrition is given greater attention than in the previous edition, although the comment is made that "the question whether or not there is any merit in so choosing the food that the acid-forming elements thus introduced into the body shall be balanced by equivalent amounts of base-forming elements must, in the opinion of the writer, be regarded as still open at the present time."

The chapter on iron in food and its function in nutrition has been enlarged to include the significance of copper as a supplement to iron and a classification and nutritional discussion of the various anemias. Separate chapters are devoted to vitamins A, B (B_1), G (B_2), C, D, and E, and tables of quantitative unit values are included for vitamins A, G, and C. In the final chapters dealing with the chemical aspects of growth and development, dietary standards, and the problem of the best use of food, new material is presented on

the statistical interpretation of growth experiments, on the use and limitations of dietary standards in dietary studies, and on adequate v. optimal nutrition.

A new table on factors for calorific values of various materials when burned in the oxy-calorimeter is included in the appendixes. In the table of qualitative vitamin values the vitamin B complex has been separated into vitamins B and G.

Mendel anniversary number (*Yale Jour. Biol. and Med., 4 (1932), No. 4, pp. [2]+369–648, pl. 1, figs. 6*).—This volume of critical reviews of recent developments in various fields of nutrition research is dedicated to L. B. Mendel on the occasion of the sixtieth anniversary of his birth. The papers and authors are as follows: To Lafayette B. Mendel, by G. Lusk (pp. 369, 370); Some Phases of the Growth of Physiological Chemistry in America, by R. H. Chittenden (pp. 371–384); The Surface-Area Constant in Comparative Physiology, by F. G. Benedict (pp. 385–398); Gastric Digestion—A Survey, by H. C. Bradley (pp. 399–418); Some Trends in Current Researches on the Vitamin B Complex, by G. R. Cowgill (pp. 419–427); Applications of the Physiology of Respiration to Resuscitation from Asphyxia and Drowning and to the Prevention and Treatment of Secondary Pneumonia, by Y. Henderson (pp. 429–436); Cystinuria: A Review of Some Recent Investigations, by H. B. Lewis (pp. 437–449); The Nutritive Aspects of Human Milk, by I. G. Macy (pp. 451–466); Creatine and Creatinine, by V. C. Myers (pp. 467–484); A Brief Survey of the Group of Acid-Producing and Acid-Tolerating Bacteria Known as the Lactobacillus Genus, by L. F. Rettger (pp. 485–498); The Nutritional Significance of Some Mineral Elements Occurring as Traces in the Animal Body, by M. S. Rose (pp. 499–518); The Amino Acids in Nutrition, by W. C. Rose (pp. 519–536); Respiration at High Altitudes, by E. C. Schneider (pp. 537–550); Some Biochemical Aspects of Growth, by A. H. Smith (pp. 551–562); A Review of Certain Researches Relating to the Occurrence and Chemical Nature of Vitamin A, by H. Steenbock (pp. 563–578); Certain Aspects of Water Metabolism, by F. P. Underhill (pp. 579–594); Recent Contributions to the Theory of Protein Structure, by H. B. Vickery (pp. 595–610); The Chemotherapy of Tuberculosis, by H. G. Wells (pp. 611–626); and Nitrogenous Muscle Extractives, by D. W. Wilson (pp. 627–648).

[Nutrition studies] (*Wisconsin Sta. Bul. 421 (1932), pp. 116–118, 121, 138, 139, fig. 1*).—Brief progress reports are given of studies by Elvehjem et al. (E. S. R., 67, pp. 90, 348) and by H. Steenbock and E. C. Van Donk on nutritional anemia (pp. 116, 117); by Skinner and Van Donk (E. S. R., 65, p. 490) and Hart et al. (E. S. R., 66, pp. 689, 890) on the significance of manganese in nutrition (pp. 117, 118); by D. Turner and H. Parsons on the effect of the ingestion of several varieties of plums and prunes on the reaction of urine in human subjects (p. 121); and by H. L. Templeton on the use of oranges in place of citric acid for the acidification of milk for the treatment of stomach ulcers (pp. 138, 139).

Home canning of foods for family use, F. W. Tanner and G. B. Armstrong (*Illinois Sta. Circ. 394 (1932), pp. 18, figs. 2*).—In this circular the causes and types of spoilage in home-canned foods and the methods of preventing such spoilage are discussed in simple terms as a preface to general directions for the home canning of various types of foods. Simple methods for telling whether canned foods are safe, formulas for thin, medium, and thick sirups, time-tables for processing fruits and acid vegetables in the hot water bath and nonacid vegetables and meats in the pressure cooker, and temperatures obtained at

different pressures in the pressure cooker are included. The time-tables for processing are adapted from Farmers' Bulletin 1471 (E. S. R., 55, p. 189).

[Meat cookery problems], E. Latzke (*North Dakota Sta. Bul. 256 (1932), p. 40*).—Attention is called to differences in time required for oven roasting of veal in covered roasters of various kinds.

Studies of some California fruits and vegetables, A. M. Field, G. Server, M. Milner, and G. Wood (*West. Hosp. Rev., 19 (1932), No. 5, pp. 28, 29*).—This report deals only with green beans, cabbage, carrots (large), cauliflower, celery, eggplant, mustard greens, peas, potato (Burbank), summer squash, sweetpotato, and turnip, all purchased in the Los Angeles market. The data reported include determinations of total solids and ash on the edible portion, optimum times for cooking as determined by scoring, percentage losses in solids and total ash when the vegetables were cooked to a satisfactory texture in various volumes of water, and the H-ion concentration of the water after cooking.

The optimum cooking time fell within the ranges given by Halliday and Noble (E. S. R., 60, p. 89), with the exception that turnips required 5 minutes less time than the minimum reported by these authors and cabbage required nearly double the maximum time. Values for total solids and ash showed considerable variation from the averages reported in U. S. D. A. Circular 146 (E. S. R., 65, p. 91), but as many were above as below these figures. Losses of total solids and ash were large when the vegetables were cut in small pieces before cooking and increased with increasing volume of water. These results are in conformity with various reports in the literature, including Peterson and Hoppert (E. S. R., 55, p. 87) and Field et al. (E. S. R., 60, p. 190). With increasing volume of liquid the pH decreased.

A simple device for adding load at a steady rate, E. L. Green (*Science, 75 (1932), No. 1938, pp. 219, 220, fig. 1*).—This note from the New York State Experiment Station describes, with diagram, a simple electromagnetic device for adding load at a steady rate in the apparatus for testing tenderness in green peas noted in Technical Bulletin 176 of the station (E. S. R., 65, p. 635). The device, which resembles a common device for determining the tensile strength of Portland cement, makes use of lead shot or any other round pellets and is thought to have advantages over the device employing mercury described in U. S. D. A. Circular 164 (E. S. R., 65, p. 190) on account of the cost and toxicity of mercury.

A technic for studying lactation in small animals and its use in evaluating protein levels in the diet, M. Kozlowska, C. M. McCay, and L. A. Maynard (*Jour. Nutrition, 5 (1932), No. 1, pp. 61–67, figs. 5*).—The technic described for studying the nutritional requirements of lactating rats consists essentially in reducing the litters to six in number, removing the mother from the cage with the young during feeding periods, and continuing the lactation period beyond the usual time. Under such conditions the growth of the young and weight changes in the mother are considered criteria for the value for lactation of the food being studied. Anemia in the suckling rats is prevented by feeding small amounts of iron citrate, copper sulfate, and potassium iodide before they start to drink water and later placing these salts in the drinking water.

Adequacy of the diet of Texas school children, J. Whitacre and E. D. Terrill (*Texas Sta. Rpt. 1931, pp. 91, 92*).—This progress report (E. S. R., 63, p. 487) contains data on the relation between the diet scores for the white children of the study and the occupational groups of the parents, a brief discussion of the question of seasonal differences in food consumption, and a

summary of dental data on 1,118 white children and 397 negro children in one county.

Growth in height and weight of Texas school children, J. WHITACRE and E. D. TERRILL (*Texas Sta. Rpt. 1931, pp. 92, 93*).—In this progress report (E. S. R., 63, p. 488) the findings in two supplementary studies are summarized briefly—the relative accuracy of two technics in measuring a child's standing height and the reliability of the child in recording his own diet. The results are also reported of a statistical study of data on the weight of clothing worn by boys and girls in different seasons of the year.

The physical growth of boys: A study by means of water displacement, D. E. ZOOK (*Amer. Jour. Diseases Children, 43 (1932), No. 5, II, pp. 1347–1432, figs. 33*).—This dissertation, which should be consulted in the original, presents a new method of measuring physical growth, involving the displacement of water in specially designed apparatus constructed to give the volume of the body and its various segments in cubic inches. The apparatus is described and illustrated, the method of its use is explained, and data obtained in the measurement of a well nourished and a poorly nourished group of boys from 5 to 10 years of age are presented, together with tentative growth norms for various age groups. Finally, the significance and limitations of the method are discussed, with suggestions for possible improvement and extension of the method.

The basal heat production of elderly women, F. G. BENEDICT and M. H. MEYER (*Amer. Phil. Soc. Proc., 71 (1932), No. 4, pp. 143–165, figs. 6*).—Data are reported and discussed on the basal metabolism of 23 women from 66 to 86 years of age, including 1 of 66, 1 of 68, 13 between 70 and 80, and 8 between 81 and 86 years of age. The subjects all lived at the Massachusetts Home in Boston, and the determinations were made there with the helmet apparatus devised by the senior author to do away with the discomfort of the ordinary forms of breathing apparatus. The apparatus is described and illustrated. The blood pressure of each subject was recorded by the resident physician, and independent estimates of the physical vigor of the women were made by the physician, the hostess, and the junior author. The basal metabolism determinations were continued until three or four well-agreeing periods were secured and were repeated on a second and third day and occasionally a fourth day.

According to the estimates of vigor, 2 of the subjects had unusual vitality for their age, 7 were in normal vigor, 13 in somewhat less vigor, and 1 was characterized as feeble. The total heat production ranged from 800 to 1,500 calories. The metabolism of the 10 women who were 78 years old or over was close to 1,000 calories irrespective of body weight. This is thought to be more than a coincidence, and to warrant the statement that "the clinician might accept this value as applicable, without too great error, to women 78 years of age and above." There was no regularity in the heat production per unit of body weight or per square meter of body surface as associated with age. Of other possible relationships tested, none proved significant with the exception of the heat production per kilogram of body weight referred to weight. In comparison with previously reported data for women under 50 years of age, the figures for these elderly subjects show that even at the same body weight elderly women have a definitely lower metabolism per unit weight than do younger women.

There was no definite correlation between the blood pressure and basal metabolism of these subjects. "In spite of the popular and supposedly well-founded notion that individuals with great vigor have a somewhat higher

metabolism than individuals of the slow, phlegmatic type, our comparisons suggest that those elderly women who had the greatest vigor had the lowest metabolism. This may be explained in part by the fact that those women rated as most vigorous were usually lightest in weight, and that, in the rating of vigor, the spryness that accompanies lightness in weight was confused with real physical vigor."

Of the three prediction standards commonly used, the Harris-Benedict formula agreed more closely on the average with the measured metabolism than did either the Aub and Du Bois or Dreyer formulas, but none of the standards is considered to predict accurately the metabolism of any individual elderly woman. It is thought, however, that basal metabolism observations on normal elderly women may be interpreted with a considerable degree of reliability upon the basis of the measurements reported in this paper.

Some factors influencing the fecal flora of infants, J. R. Gerstley, K. M. Howell, and B. R. Nagel (*Amer. Jour. Diseases Children, 43 (1932), No. 3, pp. 555–565*).—The bacterial studies reported were made on the stools of the infants serving as subjects in the extensive investigation of the chemical composition of the stools of infants on various diets (E. S. R., 64, p. 92).

The cultures of the stools of the infants during the period of breast milk feeding showed normal flora consisting of *Bacillus bifidus*, with a few *Micrococcus ovalis* and *B. coli*. On whole cow's milk, whole lactic acid milk, and fermented lactic acid milk, a mixed or Gram-negative bacterial flora resulted which was not appreciably changed by the addition of 3 per cent lactose to the milk unless the diet was continued over a long period. The addition of 12 per cent of lactose resulted in a Gram-positive flora similar to that obtained in the stools of breast-fed infants. The change in flora took place within 24 hours when feeding was changed from breast milk to any kind of artificial feeding, but much more slowly (2 weeks) when the change was from artificial to breast feeding. No other factor, such as rest on the metabolism bed, parenteral infection, flora of the nasopharynx, or bacteria contained in the feeding, had any appreciable effect on the intestinal flora. The important factor was considered to be enough carbohydrate, in this instance lactose, in the formula to produce the same quantitative relation between lactose and protein that exists in breast milk.

Further observations of rapid growth of the albino rat, W. E. Anderson and A. H. Smith (*Amer. Jour. Physiol., 100 (1932), No. 3, pp. 511–518*).—This report records what is considered to be the most rapid growth of the albino rat ever observed. The animals were of the same strain and housed in the same laboratory as those of the earlier growth study reported by Osborne and Mendel (E. S. R., 56, p. 191). The food consisted of 97 per cent of commercial calf meal mixed with 3 per cent cod-liver oil and supplemented ad libitum by a paste food containing whole milk powder 25, casein 25, wheat embryo 20, and lard 30 per cent. Each rat also received 20 g of lettuce daily and 3 g of dried yeast twice a week.

Data are given, with statistical analysis, on the individual growth rates from 60 to 200, 300, 400, and 500 g, respectively, of all 21 animals on the experiment, and these are compared with hitherto unpublished data on 20 of the most rapid growing rats in the study of Mendel and Cannon (E. S. R., 58, p. 592). The time required to make the increases in weight was in every case less, and the daily gain greater for the rats in the present study than for those of Mendel and Cannon. In one instance a rat gained 8 g a day for the first 4 weeks and 9.5 g daily for the remaining period. At 49 days of age it weighed 282 g, as compared with the maximum weight of 205 g at this age of male rats in the

rapidly growing colony of Smith and Bing (E. S. R., 61, p. 694). The maximum daily rate of growth observed was 9.5 g over an interval of 14 days, as compared with the so-called "growth of recovery" reported by Mendel and Cannon of 7.6 g over the same length of time.

Little correlation was shown between the weight at weaning and either the rate of growth or the maximum body weight attained. The most rapid rate of growth took place during the months of June, July, and August, a season generally considered to be least favorable for growth.

"These studies emphasize anew the possibility of facilitating the inherent capacity to grow by means of a favorable nutritive environment alone."

Factors influencing the distribution and character of adipose tissue in the rat.—II, The effect of ovariectomy and of feeding with thyroxine, L. L. REED, W. E. ANDERSON, and L. B. MENDEL (*Jour. Biol. Chem., 96 (1932), No. 2, pp. 313–323*).—In continuation of the investigation noted previously (E. S. R., 64, p. 95), similar methods were followed in determining the quantity and distribution of fat in rats on a diet rich in coconut oil following ovariectomy and thyroxine administration, respectively.

In rats completely ovariectomized at an age of between 3 and 4 weeks and killed from 7 to 14 weeks later, the percentage content of fat in the entire body and the nature of the fat, as judged by iodine number, showed no appreciable differences from untreated animals. The distribution of the fat was different, however, a smaller proportion being stored in the genital tissues and a larger in the subcutaneous tissues.

Two series of tests were made with thyroxine. In one, rats weighing 100 g each were given daily doses of thyroxine increasing from 0.5 to 2 mg, and in the other 200-g rats were given daily doses of 2 mg from the beginning of the test. The feeding was continued for 60 days in the first group and from 44 to 49 days in the second. Contrary to the results with the ovariectomized rats, the distribution of fat was similar to that in the control animals, but the total percentage content of fat was less than one-half that of the controls and the fat was more highly unsaturated.

It is pointed out that of all the factors thus far studied the character of the diet and the thyroid hormone are the only influences that have appreciably altered the quality of the storage fat.

Vital need of the body for certain unsaturated fatty acids, I, II, H. M. EVANS and S. LEPKOVSKY (*Jour. Biol. Chem., 96 (1932), No. 1, pp. 143–156, figs. 9, pp. 157–164, figs. 3*).—Two papers are presented.

I. *Experiments with fat-free diets in which sucrose furnishes the sole source of energy.*—Attention is called to the fact that in the studies of Evans and Burr (E. S. R., 57, p. 791), in which sucrose was used in place of starch or dextrin as the sole source of energy in feeding experiments with rats, the foundations were laid for the recognition of two phenomena concerned with the rôle of fats in the diet—the sparing action of fat for vitamin B (E. S. R., 62, p. 293) and the impossibility of normal growth and well-being on diets rigidly fat-free, as reported simultaneously by McAmis, Anderson, and Mendel (E. S. R., 62, p. 291) and Burr and Burr (E. S. R., 62, p. 292). This paper deals with a further study of the second phenomenon.

Rats were kept on the authors' sucrose diet from the age of 21 days until the appearance of characteristic symptoms of fat deficiency, usually at about 135 days, but occasionally not until 180 to 200 days. Various substances were then fed as curative agents. The symptoms always resulting from the fat-free diet consisted of cessation of growth, emaciation and obvious malnutrition, increased water intake, and hematuria. Contrary to the reports of various

investigators, scaliness of the skin was not always observed and tail necrosis never.

A deficiency of vitamin B was definitely ruled out as the causative factor, as excessive amounts of the vitamin did not alleviate the symptoms. Cornstarch and rice starch were effective and potato starch ineffective in curing the deficiency. Both cornstarch and rice starch freed of their fatty acids were ineffetive and the extracts of the fatty acids effective. Both of these extracts contained linoleic acid, which was effective. Glycogen and oleic acid were ineffective and coconut oil effective.

II. *Experiments with high fat diets in which saturated fatty acids furnish the sole source of energy.*—This paper deals with the rôle of single saturated fatty acids as the source of energy in diets furnishing adequate amounts of vitamin B as well as other known vitamins. Glyceryl laurate was first substituted for sucrose in the basal diet. Growth on this diet was retarded from the beginning, and 30 per cent of the animals died before the fiftieth day. The addition of small amounts of certain fatty materials, such as the ether extract of cornstarch fat, brought about marked improvement, showing that the glyceryl laurate itself was not toxic. Glycerides of caprylic and myristic acids (also obtained from coconut oil) behaved similarly to the glyceryl laurate. A synthetic oil was prepared by saponifying coconut oil, setting free the fatty acids by sulfuric acid, and reesterifying them with redistilled glycerol, and for comparison a combination of the glycerides of all of the individual fatty acids of the oil in the proportions in which they exist in the oil and the same without the liquid (unsaturated) oils. When these were fed as the sole source of energy, protection was secured with the two from which the unsaturated esters had not been removed but not with the other.

In discussing these results, the authors call attention particularly to the early and profound stunting of growth and to the lowered consumption of water in rats on diets carrying glycerides of saturated fatty acids as the sole source of energy.

The metabolism of the phospholipids.—V, The relationship between the amount of fat ingested and the degree of unsaturation of the phospholipids and neutral fat in the tissues of the rat, R. G. Sinclair (*Jour. Biol. Chem., 96 (1932), No. 1, pp. 103–125, figs. 4*).—Included in this paper is a discussion of the cause of the poor growth of rats raised on fat-free or fat-poor diets. The question is raised but not answered of a causal relationship between a low degree of unsaturation of phospholipids and subnormal growth on fat-free diets. Attention is again called to observations noted in a preliminary report (E. S. R., 64, p. 494) that scaliness of the feet and tails, described by Burr and Burr as one of the early symptoms of fat-deficiency disease, may develop in rats receiving cod-liver oil and thus can not be connected with the degree of unsaturation of the tissue phospholipids. In the author's opinion deficient utilization of the essential fat-soluble vitamins may contribute to the slow growth on fat-free diets. "Nevertheless, there seems to be at the present time no evidence which precludes the possibility that fat in the diet exerts a beneficial effect by virtue of its ability to increase the degree of unsaturation of the phospholipids. However, this latter explanation of the beneficial effect of food fat on growth should be regarded as no more than a mere possibility until some definite information has been obtained as to the function of the tissue phospholipids and the purpose of their content of unsaturated fatty acids."

A modification of the Osborne-Mendel salt mixture containing only inorganic constituents, L. G. Wesson (*Science, 75 (1932), No. 1943, pp. 339, 340*).—On account of the possibility that lactates and citrates commonly used

in salt mixtures may contain vitamins, a modification of the Osborne and Mendel salt mixture (E. S. R., 41, p. 201) has been developed which includes only inorganic salts. It is stated that the mixture is easily prepared with very little grinding, does not cake on grinding, and contains the inorganic radicals of the Osborne and Mendel mixture in equivalent proportions. Tables are given showing the quantities of the various ingredients of the Osborne and Mendel salt mixture, the McCollum salt mixture 185, the Hawk and Oser modification of the Osborne and Mendel salt mixture (E. S. R., 67, p. 183), and the present mixture to give 1 kg of the completed salt mixture, and the percentages of inorganic radicals in each of these mixtures.

Correlation of copper and manganese content of plants and mineral additions to the soil, L. Miller and H. S. Mitchell (*Jour. Amer. Dietet. Assoc., 7 (1931), No. 3, pp. 252–257*).—In an effort to throw light on the wide variations reported in the literature for the manganese, iron, and copper content of a single class of vegetables, a limited study was undertaken of the effect of additions of copper and manganese to the soil on the content of these elements in spinach and lettuce grown on the soil. The plat used for the experiment was a well cultivated soil of pH 5.99. The mineral additions consisted of copper sulfate ($CuSO_4.5H_2O$) or manganese sulfate ($MnSO_4.4H_2O$), added by mixing the pulverized salts with dried soil and drilling in the mixture along the rows. Two weeks after planting, the copper sulfate was added in quantities of 15, 20, 25, and 50 lbs. per acre and the manganese sulfate in quantities of 50, 100, and 150 lbs. per acre. For purposes of comparison the copper sulfate was added to one plat in the proportion of 20 lbs. per acre in four portions at 10-day intervals and in another manganese sulfate in the proportion of 100 lbs. per acre, also in four portions at 10-day intervals. Two spinach and one lettuce plat served as controls. When mature the plants were gathered and washed and the leaves dried and pulverized. Copper was determined by the Gebhardt-Sommer modification of the Biazzo method noted on page 653, manganese by the periodate method as described by Lindow and Peterson (E. S. R., 58, p. 411), and iron by the Kennedy method, all with slight modifications.

The total ash of the spinach was not appreciably altered by the treatment of the soil with either copper or manganese salts. This was also true of the copper content of the samples grown on soil receiving additional manganese and the manganese content of samples grown on soil receiving additional copper. The copper content of spinach grown on the copper treated soil was not appreciably higher than that of the control, except that the two highest additions of all the samples of lettuce grown on the soil receiving copper were considerably higher in copper content. The sample grown on the soil receiving four successive treatments of copper had a copper content of 12.3 mg per kilogram, as compared with 4.7 mg for the sample grown on soil treated with the same quantity of copper at one time.

The samples of spinach from soils treated with manganese sulfate were higher in manganese content than the one on untreated soil. The sample grown on soil receiving the manganese treatment at four different times contained 41 mg per kilogram, as compared with 27.3 for the sample on soil given the same quantity of manganese in a single treatment.

"These two instances of an increase in the storage of mineral by a plant when a salt of the mineral is applied to the soil in several installments may be of real significance, and warrants further investigation by agriculturists. The use of highly soluble salts of both copper and manganese in this experiment makes it quite possible that the mineral remained available to the plants for

only a short time. Thus, a fresh supply of mineral becoming available to the plant at intervals until nearly mature apparently favors storage of that mineral by the plant."

International vitamin standards (*Lancet [London], 1932, II, No. 1, p. 39; also in Brit. Med. Jour., No. 3730 (1932), p. 20*).—This statement from the Department of Biological Standards, Medical Research Council, Great Britain, announces that the international standards for vitamins A, B_1, and D (E. S. R., 66, p. 690) are now available for research workers, laboratories, and institutions in Great Britain and Ireland. "In the case of other countries, arrangements have been made to send suitable supplies of each of the above standards to approved national institutions for local distribution."

[Vitamin studies] (*Wisconsin Sta. Bul. 421 (1932), pp. 120, 121, 122, fig. 1*).—Brief summaries are given of tests by L. Stine and H. Parsons on the relative vitamin A content of Golden Bantam and White Crosby corn, harvested at the same stage of maturity and packed uniformly by the same vacuum process in the experimental laboratory of a commercial canning company, and by H. Steenbock and H. T. Scott of the yolks of eggs produced by hens under winter and summer conditions and on a ration containing irradiated yeast. Further studies by Steenbock and R. W. Haman on the irradiation of ergosterol and cholesterol are also noted briefly.

Vitamins in canned foods.—XII, Supplementary nature of grapefruit and prunes, W. H. Eddy, C. Z. Gurin, and E. F. Kohman (*Indus. and Engin. Chem., 24 (1932), No. 4, pp. 457–460, figs. 4*).—The materials tested in this continuation of the series of studies noted previously (E. S. R., 67, p. 480) included fresh ripe French prunes, fresh semiripe, ripe, and semidried Italian prunes canned by various commercial methods; raw grapefruit, and grapefruit peeled and canned in different ways.

No marked differences were observed as the result of the different canning processes. The prunes were much richer in vitamin A, slightly richer in vitamins B and G, and much less rich in vitamin C than the grapefruit. Approximately 100 mg of canned prunes contained 1 Sherman unit of vitamin A, while as large an amount as 7 g of grapefruit, raw or canned, was insufficient for maintenance. In all cases with prunes and most cases with grapefruit, 3 g of the fruit daily sufficed for maintenance over the 60-day period in the vitamin B tests. When fortified with a vitamin B (B_1) concentrate, the prunes rated somewhat higher than the grapefruit, suggesting a slightly higher content of vitamin G.

In the vitamin C tests, 3 g of the grapefruit in any form was completely protective, and only mild symptoms of scurvy were present in animals receiving 2 g daily. "No amount of canned prunes could be fed that would completely protect guinea pigs from scurvy. Evidence on the vitamin C potency of raw prunes is available only in case of the French variety. Judging from this there is some loss of vitamin C upon canning. However, canned fresh prunes have distinctly more vitamin C value than dried prunes, the only other form in which they are generally available."

Recent studies of the vitamin A and C content of dried apricots and figs, A. F. Morgan, A. Field, and P. F. Nichols (*Fruit Prod. Jour. and Amer. Vinegar Indus., 11 (1932), No. 10, p. 304*).—The figs tested included three varieties of fresh figs, Calimyrna, Kadota, and Mission; three types of dried Calimyrna, sulfured and unsulfured sundried and sulfured dehydrated, and two types of dried Mission, sulfured and unsulfured sundried.

The vitamin C content of the fresh Calimyrna and Kadota was reported to be "about equivalent to that of fresh grapes and about one-half that of fresh

peaches or prunes, since 20 to 30 g daily was sufficient to protect a standard guinea pig against scurvy for the test period of 60 days. The fresh Mission figs are probably less well endowed with this vitamin, since in doses up to 20 g no protection was afforded." The dried figs, including the sulfured, were devoid of vitamin C. It is suggested that possibly the thick skin of the fruit prevents sufficient penetration of sulfur dioxide to protect the vitamin.

Fresh figs of all three varieties were said to contain a fair amount of vitamin A, "being richer in this regard than grapes, dates, or apples but considerably less rich than fresh apricots, peaches, and prunes." Both sulfured and unsulfured dried figs showed considerable destruction of vitamin A, the unsulfured more than the sulfured. The maximum loss, about 80 per cent, was in the unsulfured sundried Missions and Calimyrnas, and the minimum, about 50 per cent, in the sulfured dehydrated Calimyrnas.

Earlier studies on the vitamin C and A content of apricots (E. S. R., 64, p. 789) were extended to the effect of cooking and processing. Brief cooking of fresh frozen apricots reduced the vitamin C content from 30 to 50 per cent, but similar cooking of the sulfured sundried fruit resulted in only slight loss. The vitamin A of the fresh fruit appeared to be slightly more available cooked than raw. The unsulfured dried fruit showed some loss in vitamin A on cooking, "retaining only 9 to 20 per cent of the value of the fresh raw fruit as compared with 16 to 26 per cent in the raw dried sample." A sample of commercially stored and processed sulfured apricots tested after 6 months' storage contained about half the vitamin C of the fresh fruit in both the raw and cooked state. Vitamin A was not affected by cooking. Attention is again called to the fact that apricots are one of the richest plant sources of vitamin A even after the loss of from 70 to 80 per cent of their original content.

Halibut liver oil as a source of vitamin A, J. A. LOVERN (*Nature [London], 129 (1932), No. 3263, p. 726*).—A brief note calling attention to wide fluctuations in the vitamin A potency of halibut liver oils.

The pecan nut as a source of vitamin A, H. LEVINE (*Jour. Home Econ., 24 (1932), No. 1, pp. 49–53, fig. 1*).—Pecan nuts are shown to be a good source of vitamin A, having a value of approximately 3.6 Sherman units per gram. This is in good agreement with the earlier work of Salmon and Livingston (E. S. R., 54, p. 90), whose experiments were carried out before the necessity of the inclusion of vitamin D in the basal vitamin A-free diet had been appreciated.

Effect of vitamin withdrawal on the monkey (Macacus rhesus), R. G. TURNER and E. R. LOEW (*Jour. Nutrition, 5 (1932), No. 1, pp. 29–34, figs. 4*).—This report is based upon observations on two groups of monkeys, one group of 6 from 2 to 4 years of age on a diet deficient at first in vitamins A and C and then in A alone, and the other a group of 8 from 1 to 2 years of age on a diet deficient only in A. Each group had a control group of 4 animals on an adequate diet.

The animals in the first group developed a scurvy-like condition in from 70 to 80 days, which was relieved by the addition of orange juice freed from vitamin A. No signs of xerophthalmia were observed, but the animals died in from 1 to 10 months with symptoms of gastrointestinal disturbance. In one animal abscesses of the tongue were found and in another abscesses of the lower molars

In the second group of younger animals death occurred in from 3 to 5 months, preceded by loss in weight and severe diarrhea. Post-mortem examination showed evidence of gastrointestinal disturbance, but xerophthalmia was not observed, and there was no suppuration in the upper respiratory tract, nasal cavities, or middle ear. Histological examination of the tissues of some of the animals revealed no signs of keratinization.

These results are in agreement with those of Tilden and Miller (E. S. R., 65, p. 92), indicating that the monkey does not develop xerophthalmia or susceptibility toward infections of the upper respiratory tract on a vitamin A-free diet.

Effect of carotene on course of B. tuberculosis infection of mice fed on a vitamin A deficient diet, M. H. Finkelstein (*Soc. Expt. Biol. and Med. Proc., 29 (1932), No. 8 pp. 969–971*).—In this preliminary report evidence is presented that "*B. tuberculosis* infection in mice deprived of vitamin A and carotene runs a more acute course than in animals receiving 0.005 mg of carotene per day. There appears to be some evidence that the acuteness of the course of infection varies quantitatively with the amount of carotene added to the vitamin A-free diet, and that vitamin D is of little importance in determining the course of *B. tuberculosis* infection in adult mice."

Vitamin studies, F. W. Christensen, E. Latzke, and T. H. Hopper (*North Dakota Sta. Bul. 256 (1932), pp. 21, 22, fig. 1*).—This progress report summarizes results for vitamin B (B_1) in pork and lean beef as affected by cooking and canning.

The distribution of vitamin B complex and its components in the peanut, F. W. Sherwood and J. O. Halverson (*Jour. Agr. Research [U. S.], 44 (1932), No. 11, pp. 849–860, figs. 4*).—This contribution from the North Carolina Experiment Station reports studies of the content of the vitamin B complex in raw unshelled Virginia Runner peanuts and the blanched splits, hearts, and red skins separated by the commercial blanching process. Later studies, after the differentiation of the vitamin B complex, are reported on the relative distribution of vitamins B and G in raw shelled peanuts of the same variety. In the latter study the general method of Hunt and Krauss (E. S. R., 60, p. 694) was followed, except that dried brewery yeast autoclaved at 20 lbs. pressure for 4 hours was used as the source of vitamin G.

In the earlier study the raw red skins were found to contain the largest amounts of the vitamin B complex, although appreciable amounts were found in the hearts and splits. In the commercially blanched products the greatest destruction of the vitamin took place in the outer exposed red skins. The later studies showed relatively larger amounts of vitamin B than of vitamin G in the shelled raw kernels.

The effect of vitamin B complex on the resistance of rats to enteritidis infection, J. R. Ross and E. C. Robertson (*Amer. Jour. Diseases Children, 43 (1932), No. 3, pp. 547–554*).—This paper contains a review of the literature dealing with the effect of lack of vitamin B on various bacterial infections and the report of a study of the resistance of young rats to infection per os with an enteritidis organism as affected by the presence or absence of vitamin B in the form of dried brewer's yeast. The rats were given the infecting organism from 1 to 8 days after the diet was begun, and the experiments were terminated in 4 weeks, thus eliminating possible effects due to the presence of vitamin G in the yeast.

Of 53 rats receiving no yeast, 10 survived the infection, while of 51 receiving yeast, 38 survived. These findings are thought to support the belief that vitamin B increases the resistance of rats to infection.

The sparing action of fat on vitamin B, II, III, H. M. Evans and S. Lepkovsky (*Jour. Biol. Chem., 96 (1932), No. 1, pp. 165–177, figs. 3, pp. 179–188, figs. 3*).—In continuation of the series noted previously (E. S. R., 62, p. 293), two papers are presented.

II. *The rôle played by the melting point and the degree of unsaturation of various fats.*—Various synthetic and natural fats differing widely in melting

point (from liquid at ordinary temperature to a melting point of 67.5° C.) and in iodine number (from 0 to 187) were tested for their sparing action on vitamin B. Cottonseed oil fats were fed at levels of 9.7, 22.7, and 51.4 per cent of the diet, each level with the addition of 50, 200, and 800 mg, respectively, of brewer's yeast of high vitamin B potency. Perilla and coconut oil fats were fed at a 22.7 per cent level, with yeast at 50 mg and 1 g levels. Growth, food consumption, and feces collection records were kept for two periods of 2 weeks each and the fat content of the feces determined following benzene extraction.

All of the fats studied, with the exception of those with melting points so high that they were not fully absorbed, showed similar sparing action for vitamin B. Neither the precise melting point nor the degree of saturation of the fats appeared to play a rôle in the sparing action.

III. *The rôle played by glycerides of single fatty acids.*—The sparing action for vitamin B of glycerides of single fatty acids was tested by feeding the acids in the sucrose basal diet at a 22.7 per cent level, with no vitamin B, and with 50 mg and 1 g of yeast, respectively, as inadequate and adequate amounts of vitamin B.

In the absence of vitamin B some of the glycerides of the single fatty acids permitted better growth than others and even better growth than the natural fats. Myristin and caprylin were most effective. With the small but inadequate amount of vitamin B the results were entirely different. The natural fat cottonseed oil was definitely superior to the glycerides of the individual acids, and no differences were apparent among the various glycerides with the exception of stearin. The growth of the animals receiving stearin was very poor, but this is attributed to the poor utilization of stearin.

At the 1 g level, cottonseed oil was again superior to the single glycerides. Some of the glycerides appeared to depress growth rate below the level on the fat-free diet.

Concentration of vitamins B_1 and B_2, P. A. LEVENE (*Jour. Biol. Chem., 95 (1932), No. 1, pp. 317–326*).—This paper reports the results of several years' work, discontinued in 1930, on the problem of the concentration of vitamin B. The progress of the investigation has been reported from time to time, the final note (E. S. R., 63, p. 710) summarizing briefly the method followed in separating vitamins B (B_1) and G (B_2).

In testing fractions of both vitamins for growth-promoting effects on rats, the growth was compared with average values for normal rats for the month of the experiment. A table is given of the growth rates for one month of 4 rats started at a weight of 50 g on the first day of each month of the year. The average growth per month for the entire year was 52 g, but the growth in individual months varied from an average of only 29 g for July and August to 72 g for September and October.

The anti-neuritic vitamin content of boiled milk, J. P. SPRUYT and W. F. DONATH (*Meded. Dienst Volksgezondh. Nederland. Indië, 21 (1932), No. 1, pp. 64–70*).—This paper supplements a previous one by Donath (E. S. R., 63, p. 287). Data obtained in feeding experiments on ricebirds and pigeons are reported, indicating that the vitamin B_1 content of milk is not destroyed to any marked degree by boiling, with or without aeration.

The toxicity of irradiated ergosterol, II, J. B. DUGUID, M. M. DUGGAN, and J. GOUGH (*Jour. Path. and Bact., 35 (1932), No. 2, pp. 209–218, figs. 6*).—In this continuation of the investigation noted previously (E. S. R., 64, p. 592), arterial calcification was used as the criterion of irradiated ergosterol poisoning in rats. Calcification of the renal arterioles was also considered a reliable indication

of toxicity. The earlier conclusion that the toxicity of irradiated ergosterol is higher on diets of high than of low calcium content was confirmed. An attempt to determine whether or not the harmful effects of excess vitamin D were accentuated by a relative lack of other vitamins in the diet, as suggested by Harris and Moore (E. S. R., 63, p. 194), yielded rather inconclusive results. The evidence suggested a possible slight influence, although not nearly as great as that of lack of calcium.

A study of the effects of ultraviolet irradiation on a group of preschool children: Preliminary report, H. D. BULL, G. H. MAUGHAN, and E. B. WARING (*Amer. Jour. Diseases Children, 43 (1932), No. 6, pp. 1502–1508*).—This is a preliminary report covering two winter seasons of the study of the effects of systematic ultra-violet irradiation on a group of healthy, well-nourished, preschool children attending the Cornell Nursery School. The first winter the children who attended the afternoon session were selected for irradiation and those in the morning session served as controls. As additional controls during the first winter, the records for illnesses and colds for the previous year for an equal number of children of the same age were used. In the second year the additional control group consisted of a group of children of the same age attending a private play school.

No definite improvement could be noted in the irradiated children "in the illness rate, in the number or severity of colds, and in the hemoglobin and red blood count, or marked changes in physical status which could be attributed to the irradiation."

Seasonal variation in antirachitic action of Arkansas sunshine, P. L. DAY (*Amer. Jour. Diseases Children, 43 (1932), No. 6, pp. 1455–1460, figs. 2*).—Biological determinations of the antirachitic potency of sunshine in Little Rock, Ark., from June, 1930, to May, 1931, inclusive, are reported, with results summarized as follows:

"The average daily amount of sunshine necessary to afford the same partial protection against rickets in rats receiving a rachitic diet varied from 5 minutes in May, June, and July to 168 minutes in December, with intermediate values for the other months." In comparison with values reported for other places, the intensity of the antirachitic rays in winter sunshine in Little Rock is considered to be of the same order as reported by various observers for Toronto, Boston, New York, and Washington but decidedly inferior to Denver. The author is of the opinion that sunshine in Little Rock from November to February, inclusive, is not satisfactory as the sole source of the antirachitic factor for infants.

Pellagra, T. R. BOGGS and P. PADGET (*Bul. Johns Hopkins Hosp., 50 (1932), No. 1, pp. 21–32, figs. 2*).—Of particular interest in this analysis of the 102 cases of pellagra seen on the Medical Service of the Baltimore City Hospitals from January 1, 1911, to December 31, 1930, are the results of liver treatment and the discussion of the association of severe alcoholism and pellagra. It is noted that in 1928, following the work of Goldberger et al. (E. S. R., 60, p. 793) concerning pellagra and Minot and Murphy (E. S. R., 56, p. 294) concerning pernicious anemia, a liver diet was adopted and has been used regularly since that time. Among 35 uncomplicated cases of pellagra before the liver diet was instituted there were 24 deaths and among 36 similar cases after the liver diet only 7 deaths. It is noted that liver extract has been found fully as effective as liver.

Of the entire number of cases reported, 40 were post-alcoholic, a form of pellagra which has become increasingly common. Various theories in explanation of this type of pellagra are suggested, the most plausible of which is

thought to be that "either alcohol itself destroys the pellagra-preventing factor in the gastrointestinal tract, or that the gastrointestinal tract is so altered by the large amount of alcohol that it is incapable of assimilating the pellagra-preventing factor."

TEXTILES AND CLOTHING

A study of the effect of artificial perspiration on the breaking strength of weighted and unweighted silks, N. M. ROBERTS and P. B. MACK (*Jour. Home Econ., 24 (1932), No. 5, pp. 450–456, figs. 2*).—The silks used in this study were from the same bolts as those used in the study noted previously (E. S. R., 67, p. 492). One unweighted and two weighted samples were treated with solutions of artificial acid and alkaline perspirations, some samples being treated once and others twice. One series of samples had been previously exposed four months to light through glass before being treated once with the perspiration solutions. Untreated samples were run for controls. The data obtained are reported in terms of breaking strength of warp and filling of 1-in. strips and of individual threads. Strength-weight factors obtained by dividing the sum of average breaking strengths (warp and filling) by the weight of silk in ounces per square yard are also given.

The results show not only a decrease in breaking strength with successive treatments, but lower breaking strengths in the series previously exposed than in the freshly weighted samples. "They indicate that if studies on the relative effects of perspiration on silks subjected to different commercial processes are to be of any value they must take into account the effects of the perspiration combined with those of the aging influences to which the silks may be subjected in actual wear."

The effect of weighting on the air permeability of silk, N. M. ROBERTS and P. B. MACK (*Jour. Home Econ., 24 (1932), No. 6, pp. 539–543, figs. 4*).—This continuation of the studies noted above was conducted at the U. S. Bureau of Standards on an air permeability apparatus which is described and illustrated. The data obtained on six pieces of silk, originally from the same bolt but varying in percentage of mineral weighting, showed decreasing permeability of air with increasing percentage of weighting, thus indicating that the comfort of a silk fabric, as well as its durability, may be reduced by the weighting treatment.

The effect of Texas sunlight on the durability and color of cotton fabrics, M. A. GRIMES (*Texas Sta. Rpt. 1931, pp. 90, 91*).—Results of studies of breaking strength, effect of sizes and finishes and colors, and measurements of ultra-violet in sunlight are briefly noted.

HOME MANAGEMENT AND EQUIPMENT

Diet as an index to living level in some Utah farm homes, A. P. BROWN (*Utah Acad. Sci. Proc., 8 (1930–1931), pp. 111–114; abs. in Utah Sta. Circ. 100 (1932), p. 6*).—In the dietary study previously noted (E. S. R., 61, p. 891), the food-consumption records of half of the families showed lower energy values than the Sherman standards. In order to determine whether or not any relationship existed between the adequacy of the diet and the general standard of living, questionnaires dealing with family personnel, farm home situation, and farm layout were sent to all of the families of the earlier study. Of the 39 schedules returned, 20 were from families whose diets had been ranked as satisfactory in fuel value and 19 unsatisfactory. Analyses of the schedules of the two groups showed that the parents in the first group were younger and

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better educated than those in the second group and had at least as good present educational contacts. A higher percentage of this group lived on the farms rather than in town. More of them had attractive homes according to their own appraisal, and there were more conveniences, such as automobiles, telephone, water in the home, bathroom equipment, electric lights, and various labor-saving devices.

The author concludes that in so far as the factors studied promote satisfying home living, the diet may be taken as a general index of living level in the homes studied.

The farm home, F. A. CUTHBERT (*Oregon Sta. Bul. 293 (1932), pp. 56, figs. 36*).—This bulletin contains practical information on the selection of a farm home site, choice of farm residence, and landscaping the farm home. An appendix contains house and garden plans, relating especially to the remodeling of houses and cottages, the design of a 7-room house and grounds, and certain special garden designs.

House insulation: Its economies and application (*Washington: U. S. Dept. Com., Natl. Com. Wood Util., 1931, pp. V+52, figs. 34*).—This is a report of the subcommittee on house insulation, its economies and application, of the National Committee on Wood Utilization, and was prepared by R. E. Backstrom. It contains both technical and popular information on building insulation for the use of designers, builders, and owners, and includes sections on types of insulation; insulation of walls, floors, and roofs; thickness of insulation to use; methods of applying insulating materials; insulation of the house already built; and cost of insulating. Appendixes deal with weatherproofing, fuel savings effected by insulation and weatherproofing, examples of the cost of insulating, and a bibliography.

MISCELLANEOUS

Report on the agricultural experiment stations, 1931, J. T. JARDINE, W. H. BEAL, H. M. STEECE, ET AL. (*U. S. Dept. Agr., Off. Expt. Stas., Rpt. Agr. Expt. Stas., 1931, pp. 146*).—This report is discussed editorially on page 641.

Report of Moses Fell Annex Farm, Bedford, Indiana, June, 1932, H. J. REED and H. G. HALL (*Indiana Sta. Circ. 191 (1932), pp. 20, figs. 7*).—The experimental work summarized in this report is for the most part abstracted elsewhere in this issue.

Experiment station progress: Report for the biennium July 1, 1929, to June 30, 1931, P. F. TROWBRIDGE ET AL. (*North Dakota Sta. Bul. 256 (1932), pp. 62, figs. 19*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Forty-fourth Annual Report [of Texas Station], 1931, A. B. CONNER ET AL. (*Texas Sta. Rpt. 1931, pp. 192*).—The experimental work not previously reported is for the most part noted elsewhere in this issue.

Meeting agriculture's old and new problems with the aid of science: Annual report of the director, [Wisconsin Station, 1931], compiled by N. CLARK (*Wisconsin Sta. Bul. 421 (1932), pp. 154, figs. 46*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Annual summary of publications, July 1, 1931, to June 30, 1932, B. C. PITTMAN (*Utah Sta. Circ. 100 (1932), pp. 12*).—In addition to abstracts of Bulletins 231–234 and Circulars 95–99, this contains abstracts of scientific articles published outside the station series and for the most part noted elsewhere in this issue or previously.

NOTES

Maryland University.—At its recent commencement the honorary degree of doctor of science was conferred upon Dr. A. F. Woods, director of scientific work of the U. S. Department of Agriculture. An earlier statement in these columns (E. S. R., 67, p. 351) ascribing the conferring of this degree to the University of Missouri was erroneous.

Minnesota Station.—A new field house has been completed through the use of funds provided by the State legislature at the request of the Minnesota Crop Improvement Association. The new building will greatly facilitate the work which the station is doing in developing field crops.

The number of samples grown by the central station, the various substations, and by cooperating farmers now mounts into the thousands every year. For example, by actual count 2,747 small grains and flax samples from various plats at substations were handled last year. In addition, there were some 9,903 samples for preliminary yield trials of new varieties and practically 10,000 self-fertilized ears, 4,000 crossed ears, and 3,000 hand-pollinated ears from corn breeding studies. The new building is designed to expedite the handling of this material.

The building is 40 by 80 ft. and contains a large room for storage of grain and samples before drying and threshing, provision for which is located on the second floor. There are also a laboratory for corn improvement studies, a series of drying ovens on both floors to be used in determining moisture content of forage and corn samples, cleaning devices, weighing and threshing rooms, and other facilities.

Nebraska Station.—Plans have been approved, the contract let, and work begun on a new fireproof seed house and crops laboratory. The building will be finished in face brick and is 90 ft. long, 40 ft. wide, and three stories high. The upper story will be used for laboratory purposes.

New York State Station.—The station's first Dairy Day, held on August 17, attracted an attendance of 800 despite unpropitious weather, and it is expected to repeat the occasion annually. On the following day, Dairy Industry Day was observed with about 200 ice cream manufacturers, milk dealers, and others in attendance.

Four units of the Russian type of soil lysimeter have been installed in the station orchard, making possible the study of orchard soils to a depth of 5 ft. without in any way disturbing the soil as it occurs in the orchard. The equipment consists of a wooden box 3 ft. wide, 8 ft. long, and 5 ft. deep, heavily coated with waterproofing material and sunk into the ground at various points at the outer limit of the spread of the branches of an apple tree. It is possible to remove one side of the box to study the root development of the tree. At the bottom of each "horizon," or soil layer, and about 2 ft. from the box a metal funnel 1 ft. in diameter has been installed with a pipe leading back into the box. By means of these funnels the drainage water from each soil layer can be collected in containers placed in the box and later analyzed in the laboratory. Four layers of soil are thus under investigation in the

orchard. On the surface of the ground and over the funnels there will be a series of small plats which will receive various fertilizer and cultural treatments. It is expected that much can be learned about orchard soil management by studying the drainage water collected under these different treatments.

North Carolina College and Station.—Dr. George Tayloe Winston, president from 1899 until his retirement in 1908, died August 26 at the age of 79 years. He had also served as president of the Universities of North Carolina and Texas.

A feature of a recent farmers' convention was a presentation of a play depicting the formation of the station and its early history. The purpose of the play was to reveal the important part taken by the farmers of the State in the establishment of the station, to emphasize the individuality of the station and its work, and to show what it has to offer for the present needs of agriculture. Although the time allotted on the convention program began at 8 a. m., a good attendance of farm women and others was secured and considerable interest developed.

Rhode Island College and Station.—Recent appointments include L. E. Erwin as instructor in bacteriology and assistant plant pathologist, beginning September 1, and French M. Hyre as assistant agricultural economist beginning August 1.

Vermont University.—According to a recent announcement in *School and Society*, a legal decision has been rendered whereby the university is held to have complied with the terms imposed by the late James B. Wilbur, of Manchester, by limiting its enrollment in the College of Arts and Sciences to 1,000 students, and will therefore receive ultimately from the Wilbur Trust Fund at least $1,500,000. This fund was bequeathed to the university, but in case of noncompliance with the terms of the will would have reverted to the Library of Congress. In the hearing on the case, the attorneys for the Federal Government sought to show that the State Agricultural College was an integral part of the university, and that the combined enrollment for the institution had exceeded the limit imposed by the will. The decision held, however, that the University of Vermont, a corporation organized by the State on November 3, 1791, had continued in existence for all purposes, including the receipt of donations, that the bequest was to this university, and that as the Medical College, College of Engineering, and College of Agriculture, the two-year training course for teachers, and the summer school were not parts of the original university their enrollment should not be included in determining limitations on the enrollment.

The practical effect of this decision is to limit only the College of Arts and Sciences, enrollment in which has never reached 1,000 students.

INDEX OF NAMES

Abbot, C. G., 654.
Abbot, O. D., 619.
Abe, T., 267.
Abell, M. F., 613.
Ackerman, W. T., 595.
Ackerson, C. W., 729.
Ackert, J. E., 604.
Acree, S. F., 364.
Adair, E. E., 433.
Adair, E. W., 433.
Adam, D. B., 142.
Adams, J. F., 414.
Adams, L. P., 471.
Addoms, R. H., 40.
Addoms, R. M., 524.
Adkins, K. M., 493.
Adriance, G. W., 533.
Adriano, F. T., 337.
Aglibut, A. P., 326.
Agnew, M. A., 85.
Agostini, A., 703.
Ahlgren, H. L., 669.
Ahlström, L., 482.
Ahmad, B., 342, 631.
Ahmad, N., 238.
Ahmann, C. F., 619.
Aikman, J. M., 377.
Aitken, H. A. A., 487.
Aitkenhead, W., 59.
Albert, A. R., 669.
Albright, W. P., 303.
Alcock, N. L., 555.
Aldaba, V. C., 154.
Alderman, O. A., 41.
Aldous, A. E., 124, 239.
Alektorova, A. V. V., 894.
Alex, A. H., 705.
Alexander, L. J., 48.
Alexander, R. A., 70.
Alexander, W. B., 352.
Ali, B., 107.
Ališvdina, A. A. 384.
Alicata, J. E., 461.
Allard, H. A., 117.
Allen, E., 376.
Allen, E. A., 320.
Allen, F. W., 251, 392.
Allen, H., 95.
Allen, H. W., 562, 563.
Allen, L. A., 798.
Allen, N., 56, 281.
Allen, O. N., 667.
Allen, R. C., [illegible].
Allen, R. F., [illegible].
Allen, T. C., [illegible].
Allison, F. E., [illegible].
Allison, R. V., 505, 516, 523.
Allison, W. H., 16.
Allman, S. L., 153, 237.
Almquist, H. J., 4.
Alsberg, C. L., 198.
Alten, F., 118.
Amsel, D. J., 585.
Ames, J. W., 223.
Amundson, G., 496.
Anders, C. B., 640.
Andersen, D. H., 122.
Andersen, K. T., 298.
Anderson, A. C., 109, 655.
Anderson, E., 4.
Anderson, E. D., 324.
Anderson, H. G., 616.
Anderson, H. V., 357.
Anderson, H. W., 274, 275.
Anderson, M. E., 690.
Anderson, M. L., 293.
Anderson, P. J., 381, 383.
Anderson, T. J., 426.
Anderson, W. E., 772, 773.
Anderson, W. S., 29, 35, 94.
Andre, P., 331.
Andres, A., 285.
Andrés, C. G. de, 545.
Andrewes, H. E., 287.
Anstead, R. D., 408.
Anthony, R. L., 66, 191.
Anthony, R. D., 253.
Aquino, D. I., 19.
Arakawa, H. Y., 298.
Areceneaux, G., 672.
Archer, W. A., 263.
Archibald, J. G., 447.
Arens, C. W., 175.
Arens, K., 695.
Armentrout, W. W., 619.
Armstrong, G. B., 769.
Armstrong, J. M., 229.
Armstrong, S. F., 81.
Armstrong, W. D., 689.
Arndt, C. H., 268.
Arnold, L., 483.
Arthur, J. C., 589.
Arthur, J. M., 254.
Arthur, S. C., 421.
Ascalon, S. J., 337.
Asdell, S. A., 745.
Ashby, S. F., 762.
Ashby, W., 175, 250, 755.
Ashe, W. W., 409.
Ashley, T. E., 639.
Ashton, M. R., 499.
Ashworth, U. S., 448, 636.
Askew, F. A., 201.
Askew, H. O., 741.
Åslander, A., 22, 115, 228.
Asmundson, V. S., 321, 693.
Aspinwall, C. A., 566.
Astruc, H., 46.
Atkins, I. M., 667.
Atkinson, D. J., 267, 562.
Atkinson, N. J., 288.
Atteck, O. S., 228.
Aubel, C. E., 299.
Auchinachie, D. W., 345.
Aujeszky, L., 210.
Austin, E., 210.
Austin, H., 315, 455.
Austin, M. D., 567.
Authenrieth, A. J., 381.
Axtmayer, J., 481.
Ayres, J. C., 522.
Ayres, W. E., 761.
Ayyangar, C. R., 416.
Ayyangar, G. N. R., 25, 26.
Ayyer, T. V. R., 289.
Azzi, G., 130.

Baba, S., 286.
Babajan, D. N. T., 691.
Babcock, O. G., 706.
Bach, W. J., 396, 690.
Bachtell, M. A., 17, 30, 65.
Back, E. A., 428.
Bacon, R. F., 20.
Badger, L. F., 438, 577.
Baerg, W. J., 578.
Bailey, C. H., 96, 339, 358, 478.
Bailey, E. H., 111.
Bailey, E. M., 590.
Bailey, J. S., 385.
Bailey, L. H., 258.
Bailey, V., 148.
Bain, J. B., 67.
Bainer, R., 496.
Baird, R. W., 750.
Baker, C. E., 391.
Baker, F. E., 56.
Baker, G. A., 162.
Baker, K. F., 699.
Baker, O. E., 757.
Baker, R. W., 347.
Baker, W. S., 428.
Baker, W. W., 369, 576.
Bakke, A. L., 377.
Bakken, H. H., 797.
Balabaev, G. A., 384.
Balabayev, G. A., 384.

Bald, J. G., 151, 430, 551.
Baldwin, H. I., 41.
Baldwin, I. L., 657.
Baldwin, R. J., 496.
Ballard, J. C., 366.
Ballinger, R. A., 82.
Ballou, F. H., 331, 410.
Balls, A. K., 210.
Banerjee, P. C., 745.
Banfield, W. M., 538, 698.
Barackman, R. A., 338.
Barenberg, L. H., 482.
Barker, H. T. P., 401.
Barker, J., 510.
Barker, S. G., 93.
Barnard, C., 395.
Barnes, B. O., 347.
Barnes, E. E., 16, 29, 203, 468.
Barnes, H. F., 352.
Barnette, R. M., 505.
Barr, H. T., 322.
Barrenscheen, H. K., 100.
Barrett, J. T., 279.
Barrett, R. E., 49, 565.
Barron, D. H., 662.
Bartel, L. H., 589.
Bartells, G. C., 324.
Bartholomew, R. P., 368, 658.
Bartlett, J. M., 673, 674.
Bartlett, J. W., 594.
Barton, L. V., 262, 533.
Barton, O. A., 722, 739.
Basore, C. A., 465.
Bass, C. M., 522.
Bassett, H. N., 466.
Basu, J. K., 106.
Batt, H. E., 596.
Batten, E. T., 668.
Bauer, F. C., 506.
Baumann, C. A., 723.
Baur, E., 108.
Bavendamm, W., 48, 419.
Beaver, L. D., 496.
Baxter, D. V., 703, 704.
Bayfield, E. G., 29.
Bayles, J. J., 667, 673.
Baylis, H. A., 149.
Bayon, H. P., 458.
Beach, B. A., 454, 740
Beach, J. R., 459.
Beach, W. S., 45.
Beadle, G. W., 125, 514.
Beal, J. A., 717.
Beal, W. H., 782.
Beall, G., 264.
Bean, L. H., 469.
Bear, N. R., 75.
Beard, H. H., 346, 347, 633, 634.
Beare, W. K., 376.
Beath, O. A., 70, 738.
Beaudette, F. R., 74, 321, [illegible], 747.
Beaumont, A. B., 35, [illegible].
Beaumont, J. H., 258, 529, 682, 684.
Beavens, E. A., 5.
Beck, H. H., 490.
Beck, P., 119.
Becker, R. B., 593.
Beckett, R. E., 33.
Beckwith, C. S., 524, 561.
Becnel, I. J., 268.
Bedford, G. A. H., 70.
Beecher, F. S., 20, 274.
Beeman, H. N., 449.
Beeson, C. F. C., 438.
Bell, D. S., 58.
Bell, F. G., 378.
Bell, H. G., 284.
Bell, M. A., 518.
Bell, M. E., 635.
Bell, W. B., 281.
Belling, J., 201.
Bender, C. B., 594.
Bender, R. C., 589.
Bendixen, H. A., 595.
Benedict, F. G., 86, 474, 587, 769, 771.
Benedict, J., 104.
Benedict, M. R., 470.
Benham, R. W., 599.
Benjamin, H. R., 487.
Benjamin, L. V., 243.
Bennett, C. W., 554.
Bennet, E., 378, 447.
Bennett, M. K., 182.
Bennett, N. G., 341.
Bennett, S. C. J., 743.
Bennetts, H. W., 600.
Bentley, R. C., 470.
Benton, A. H., 618.
Beresford, H., 327.
Berestneff, A. A., 464.
Berge, 604.
Berkeley, G. H., 415.
Bernal, J. D., 201, 502.
Berolzheimer, D. D., 645.
Berry, L. N., 730.
Berry, M. H., 732.
Bertrand, G., 479.
Besley, H. E., 811.
Bethke, R. M., 58, 65, 68, 448, 730.
Betten, C., 96, 192.
Betz, B. J., 581.
Bevan, L. E. W., 598.
Bewley, W. F., 244.
Bey, N. S., 284.
Beynum, J. van, 163.
Bhalerao, G. D., 750.
Bhalerao, S. G., 129.
Bhat, S. S., 277.
Bibby, F. F., 432.
Bice, C. M., 302, 444.
Bickart, H. M., 524.
Biely, J., 321, 490, 608.
Biester, A., 623.
Bigger, J. H., 577.
Bilger, L. N., [illegible].
Bills, C. E., 502.
Bilsing, S. W., 705.
Birch, T. W., 102.
Bird, E. W., 209, 447.
Bird, L. G., 281.
Bird, R. D., 281.
Birmingham, W. A., 698, 700.
Bishop, C. J., 23.
Bishop, L., 168.
Bishop, L. M., 314, 598.
Bishop, W. B. S., 118.
Bisserup, A., 638.
Bisson, C. S., 248.
Bixby, F. L., 462.
Black, A., 62.
Black, A. G., 470.
Black, J. D., 179, 470, 614, 757.
Black, L. A., 307.
Black, L. M., 63, 612.
Black, W. H., 723.
Blackman, F. F., 659.
Blackmon, G. H., 523.
Blackwood, A. J., 174.
Blair, A. W., 370, 505, 507, 524.
Blake, M. A., 524.
Blanc, A., 79.
Blanc, G., 741.
Blanchan, N., 420.
Blanck, E., 109.
Blank, L. M., 690.
Blank, M. H., 616.
Blauser, I. P., 75.
Bledsoe, R. P., 513.
Blieck, L. de, 170.
Blinks, L. R., 372.
Bliss, D. E., 399.
Bliss, S., 92.
Block, R. J., 9, 502, 503, 647.
Blodgett, E. C., 257.
Blood, H. L., 698.
Blood, P. T., 505, 517.
Bloodgood, D. W., 76.
Blunck, H., 43, 285, 419.
Blunt, D. L., 430.
Boak, R. A., 71.
Bobilioff, W., 398.
Bock, J. C., 209.
Bocskowska, M., 483.
Bödecker, C. F., 479.
Bodenheimer, F., 419.
Bodenheimer, F. S., 285.
Bodnar, G. P., 328.
Boekhout, F. W. J., 162.
Boelter, L. M. K., 496.
Boggs, T. R., 780.
Bohstedt, G., 728, 731.
Boile, P. C., 272.
Bolley, H. L., [illegible].
Boncato, P. G., [illegible].
Böning, K., [illegible].
Bonnen, C. A., [illegible].
[illegible]
[illegible]
[illegible]

Börner, C., 419.
Borodin, I. N., 508.
Borst, H. L., 29, 75.
Borthwick, H. A., 247, 525.
Borts, I. H., 812.
Bos, A., 171.
Bosma, N. J., 283.
Bottorff, C. A., 596.
Boucher, R. V., 445.
Bouquet, A. G. B., 676.
Bourdelle, J., 79.
Bourdillon, R. B., 201.
Bourne, A. I., 424, 427.
Bourne, B. A., 516.
Bouygues, H., 21.
Böving, A. G., 57.
Bowden, F. P., 500.
Bowen, J. T., 178.
Bowen, J. W., 365.
Bowling, G. A., 448.
Bowman, J. J., 555.
Boyce, A. M., 265, 423.
Boyce, J. S., 280.
Boyd, E., 60.
Boyd, F., 639.
Boyd, G. R., 496.
Boyd, O. C., 399.
Boyd, T. C., 337.
Boyd, W. L., 168, 314, 451.
Boynton, L. C., 481.
Boynton, W. H., 311.
Brabham, H. K., 127.
Bracewell, M. F., 344.
Bradfield, R., 16.
Bradley, G. H., 436.
Bradley, H. C., 769.
Bradner, M. I., 263.
Branaman, G. A., 60.
Brandly, C. A., 746.
Brandon, J. F., 128.
Brandt, E. A., 331.
Brandt, P. M., 731.
Brannon, D., 425.
Branscheidt, P., 89.
Brase, K., 249, 256.
Bratley, H. E., 559.
Braucher, P. F., 122.
Braun, H., 142.
Braun, K., 100.
Bray, C. I., 301, 727.
Bray, R. H., 363.
Breaux, S. J., jr., 233.
Breckenridge, G. F., 646.
Breed, R. S., 806, 765.
Breedis, C., 821.
Bregger, J. T., 895.
Bremer, H., 285, 291.
Brenckman, F., 614.
Brennen, C. A., 471.
Brentzel, W. E., 690.
Bressman, E. N., 285.
Brewer, P. H., 697.
Brierley, W. B., 537.
Brierley, W. G., 89, 580.
Briggs, F. N., 140.
Brigham, R. S., 414.
Brink, R. A., 230, 609, 674.
Brink, R. C. R. van den, 246.
Briones, G. R., 40.
Bristol, R. S., 243, 384.
Briton-Jones, H. R., 47, 48.
Britton, W. E., 565.
Brizi, A., 767.
Brockelbank, E. E., 231.
Brodie, J. B., 159.
Brody, S., 445, 448, 586, 626, 627.
Broerman, A., 69, 603.
Bromley, S. W., 51, 565, 566.
Brooker, M. A., 619.
Brooks, A. N., 535.
Brooks, D. B., 755.
Brooks, E. M., 11.
Brooks, F. A., 611.
Brooks, H. J., 160.
Brooks, L. E., 668, 673, 690.
Broome, G. C., 706.
Brown, A., 490.
Brown, A. P., 781.
Brown, B. A., 236.
Brown, B. E., 671.
Brown, C. A. C., 754.
Brown, C. M., 768.
Brown, G. A., 191.
Brown, G. G., 465.
Brown, H. B., 238.
Brown, H. W., 310.
Brown, J. G., 269.
Brown, J. H., 313.
Brown, L. A., 110.
Brown, M., 623, 624.
Brown, N. A., 557.
Brown, P. E., 106, 114, 366, 378, 652, 657, 658.
Brown, R. D., 468.
Brown, R. J., 652.
Brown, W. R., 451.
Browne, A. C., 423.
Browne, F. L., 79.
Browning, E., 189.
Brownlee, A., 598, 744.
Bruce, D., 688.
Bruce, E. A., 450.
Bruce, H. M., 201.
Brues, C. T., 423.
Bruijning, W. H., 522.
Brunner, E. deS., 182.
Bruno, B., 453.
Bryan, A. A., 377.
Bryan, C. G., 301.
Bryan, C. S., 5, 494.
Bryan, C. W., 753.
Bryan, H., 31.
Bryan, K., 462.
Bryant, J. H., 318.
Bryce, P. I., 430.
Buchanan, D., 61.
Buchanan, L. L., 579.
Buchmann, W., 285.
Buck, J. M., 453, 454.
Buckell, E. R., 288.
Bugher, J. C., 202.
Bulger, J. W., 562.
Bull, H. D., 780.
Bullard, J. F., 73.
Bullis, K. L., 457.
Bullock, F. J., 177.
Bunyea, H. 459.
Burchard, G., 690.
Burdette, R. C., 424, 561, 564.
Burger, G., 629.
Burgess, A. F., 565, 570.
Burgess, E. D., 577.
Burgwald, L. H., 784.
Burk, L. D., 158.
Burke, H. E., 707.
Burkett, G. W., 225.
Burkholder, C. L., 679.
Burkholder, W. H., 149.
Burlison, W. L., 508.
Burnett, L. C., 377.
Burnett, W. L., 148.
Burr, W., 182, 472.
Burr, W. W., 638.
Burrell, A. B., 389.
Bushnell, J., 29, 36, 239.
Bushnell, L. D., 746.
Bushnell, R., 706.
Busic, W. H., 749.
Buswell, A. M., 751.
Butcher, F. G., 717.
Butler, A. M., 7.
Butler, H. G., 439, 561, 571.
Butler, O., 536.
Butovitsch, V., 285.
Button, F. C., 594.
Byerly, T. C., 28.
Bynum, E. K., 57.

Cablanca, S., 607.
Caesar, L., 234.
Caffrey, D. J., 713.
Cagle, L. R., 282, 718.
Cahill, V., 414.
Cain, C. B., 317, 840.
Caine, A. B., 444, 470.
Calder, D., 164.
Caldwell, E. L., 810.
Caldwell, J., 537.
Caldwell, J. S., 676.
Caldwell, R. M., 691.
Calhoun, P. W., 439.
Callaghan, A. R., 239.
Callow, R. K., 201.
Calma, V. C., 683.
Cameron, A. E., 450.
Cameron, D., 756.
Cameron, D. C., 11.
Caminopetros, J., 741.
Camp, A. F., 523, 711.
Camp, J. P., 526.
Campbell, A. S., 62.
Campbell, C. E., 332.
Campbell, F. L., 50.
Campbell, H. L., 472.
Campbell, H. W., 459.

Campbell, J. P., 614.
Campbell, P. A., 63.
Campionaria, F., 659.
Camus, 748.
Cannon, C. Y., 178, 378, 447, 462.
Cannon, J. Q., jr., 465.
Cannon, W. N., 541.
Cappelletti, C., 538.
Card, C. G., 64, 191.
Cardinell, H. A., 526.
Cardon, P. V., 322, 469.
Carlson, J. W., 126, 237.
Carlyle, E. C., 740.
Carne, H. R., 600, 744.
Carnes, A., 608
Carnes, E. H., 438.
Carns, A. G., 396.
Carolus, R. L., 131.
Carpano, M., 74, 743.
Carpenter, C. M., 71.
Carpenter, C. W., 272.
Carpenter, R. W., 496.
Carré, G., 610.
Carrero, J. O., 500.
Carrión, A. L., 438.
Carroll, W. E., 727.
Carsner, E., 271.
Carstarphen, F. C., 78.
Carter, D. G., 350, 610.
Carter, R. H., 425, 708.
Carver, W. A., 516.
Casanova, O. B., 28.
Case, H. C. M., 180.
Casella, D., 37, 40.
Cash, L., 544.
Cathcart, C. S., 19, 36, 115.
Catherwood, F. L., 339.
Cation, D., 45.
Causey, O. R., 437.
Ceder, E. T., 438, 577.
Celino, M. S., 435.
Cerecedo, L. R., 343.
Chace, E. M., 622.
Chahine, M. A., 185.
Chakmakjian, H. H., 105.
Chamberlain, E. B., 281.
Chamberlin, F. S., 49, 558, 709.
Chamberlin, N. S., 751.
Chamberlin, V. D., 58, 303, 593.
Chamberlin, W. J., 287.
Champigny, H., 609.
Chan, K. S., 431.
Chandler, A. C., 750.
Chandler, S. C., 56, 560.
Chandler, W. H., 245.
Chapman, H. D., 6.
Chapman, H. H., 688.
Chapman, J. E., 656.
Chapman, P. J., 150, 427, 526, 709.
Chaptal, L., 210.
Charles, T. B., 592.
Charley, V. L. S., 183.
Chatfield, C., 184.
Chaudhuri, H., 46, 47.
Cheema, G. S., 277.
Cheesman, E. E., 395.
Cherrington, V. A., 167.
Cherry, W. F., 530.
Chesley, K. G., 357.
Chesnokov, P. G., 706.
Cheyney, E. G., 687.
Chichester, D. F., 640.
Chilcott, E. C., 666.
Chilton, F., 292.
Chima, I. S., 260.
Chittenden, D. W., 445.
Chittenden, R. H., 769.
Chitwood, B. G., 282, 746.
Chobot, R., 199.
Chorine, V., 423.
Christensen, F. W., 722, 778.
Christensen, J. J., 512, 542.
Chrystal, R. N., 289, 584, 721.
Chu, C. C., 164.
Chucka, J. A., 655.
Chute, H. M., 640.
Clara, F. M., 146.
Clark, A. F., 566.
Clark, A. H., 432.
Clark, C. A., 50.
Clark, E. P., 206.
Clark, F. E., 334.
Clark, F. H., 663.
Clark, H. C., 431.
Clark, I., 249.
Clark, J. A., 180.
Clark, J. H., 394, 524.
Clark, N., 782.
Clark, S. W., 706.
Clark, V. I., 124.
Clarke, A. E., 668.
Clarke, M. K., 457.
Clarke, W. S., jr., 253.
Clausen, C. P., 582.
Clausen, R. E., 375, 376.
Clawson, M., 762, 763.
Claypool, L. L., 250, 257, 393, 528, 681.
Clayton, C. F., 179.
Clayton, E. E., 270, 540, 547.
Cleare, L. D., jr., 443.
Clement, C. E., 67, 178.
Clément, R., 490.
Cleveland, C. R., 425.
Clifford, W. M., 621.
Cline, J. A., 473.
Clover, J. P., 31.
Clyde, A. W., 327.
Clyde, G. D., 322, 654.
Coatney, G. R., 155.
Cobb, C. A., 614.
Cobb, N. A., 352.
Cobb, W. B., 656.
Coble, M. F., 558.
Coblentz, W. W., 90.
Cochran, D. M., 558.
Cochran, G. W., 674.
Cockerham, G., 265.
Code, W. E., 178, 606.
Coe, F. M., 681.
Colby, A. S., 258, 683.
Colby, W. G., 127, 378.
Cole, A. C., jr., 581.
Cole, B., 480.
Cole, F. E., 427.
Cole, H. H., 282.
Cole, J. R., 147.
Coleman, L. C., 156.
Coles, H. G., 14.
Coles, J. D. W. A., 70.
Colla, S., 20.
Colley, M. W., 374.
Collins, C. W., 50, 53, 565.
Collins, E. V., 378, 462, 577.
Collins, H. L., 333.
Collins, S. D., 430.
Collison, R. C., 220, 250, 253.
Collison, S. E., 253.
Colón, I. A., 521.
Combes, R., 659.
Combiesco, D., 444.
Combs, W. B., 68.
Comin, D., 35.
Compere, H., 432.
Compton, C. C., 150.
Condit, I. J., 260.
Connard, M. H., 40.
Conner, A. B., 515, 782.
Conner, W. H., 505.
Connors, C. H., 397, 524, 685.
Conolly, R. A., 64.
Conrad, J. P., 667.
Conrey, G. W., 16.
Conroy, C. C., 10, 11.
Conway, W. T., 380.
Cook, D. H., 481.
Cook, G. S., 637.
Cook, H. T., 409, 424.
Cook, M. T., 137, 272, 549.
Cook, O. F., 127.
Cook, R. L., 37.
Cook, W. S., 288.
Cooke, R. A., 199.
Coon, J. M., 768.
Cooper, D. C., 226.
Cooper, H., 450.
Cooper, H. P., 666.
Cooper, T. P., 613.
Copeland, L., 66.
Copeland, O. C., 731.
Coppin, C. A., 352.
Corbett, G. H., 426, 433.
Corkins, C. L., 57, 156, 440.
Corsan, G. H., 281.
Cory, E. N., 424, 560, 565, 705, 713, 714.
Cory, V. L., 124, 740.
Costantin, J., 538.
Cotter, R. U., 543.
Cotterell, G. S., 430.
Cottier, W., 154.
Cotton, J. R., 233.
Cotton, R. T., 428.

Cotton, W. E., 167, 453, 454.
Couch, J. F., 165.
Cover, S., 480.
Covington, N. G., 71.
Coward, K. H., 200.
Cowdry, E. V., 314.
Cowgill, G. R., 502, 503, 633, 634, 647, 769.
Cowles, M. L., 767.
Cowlin, R. W., 688.
Cox, G. H., 487.
Cox, J. A., 442.
Cox, R. W., 617.
Coyle, V., 113.
Craig, R. S., 313.
Craighead, F. C., 57.
Cram, E. B., 288.
Cramp, R. C., 600.
Crampton, E. W., 728.
Crane, H. A., 705.
Crane, M. B., 514.
Craven, A., 836.
Crawford, A. B., 167.
Crawford, M., 321.
Cresson, E. T., jr., 154.
Crew, F. A. E., 420.
Crickman, C. W., 757, 758.
Crocker, W., 255, 386, 522.
Crosby, C. R., 49, 427.
Cross, F., 744.
Crowther, E. M., 17.
Cruz, A. O., 359.
Csonka, F. A., 195.
Cubbon, M. H., 367.
Culbertson, C. C., 444, 445.
Cullinan, F. P., 527.
Culp, F. B., 91.
Culpepper, C. W., 675, 676.
Cumings, G. A., 519.
Cumming, W. M., 195.
Cunningham, I. J., 340, 345.
Cunningham, J. F. 351.
Cunningham, J. R., 171.
Cunningham, N. T., 337.
Curasson, G., 315.
Curphey, T. J., 745.
Curran, H. R., 307.
Curry, A. S., 76.
Curtis, J. J., 128.
Curtis, N., 127.
Curtis, N. J., 378.
Curtiss, C. F., 494.
Curzi, M., 268.
Cuthbert, F. A., 782.
Cutler, J. S., 29, 30, 75, 240, 380.
Cutler, W. L., 385.
Cutright, C. R., 49, 50, 54, 425.
Czarnetzky, E. J., 197, 357.
Czibulka, F., 12.

Daane, A., 516.
Dahlberg, A. C., 306, 725.
Dahlberg, H. W., 652.
Daines, L. L., 315, 455.
Dakin, H. D., 199.
Dalling, T., 73, 171.
Dameron, W. H., 665, 723, 740.
D'Amour, F., 122.
Dana, B. F., 545, 556, 690.
Dana, S. T., 614.
Daniel, D. M., 427, 441, 681.
Danks, W. B. C., 452.
Dann, W. J., 188.
Darby, C. R., 625.
Darnell-Smith, G. P., 409.
Darrow, G. M., 135, 258, 393, 394, 395.
Das, S., 18.
Dastur, J. F., 269.
Daubney, R., 168, 452.
Davenport, C. B., 497.
David, P. A., 663.
Davidson, J. B., 462, 470.
Davidson, S., 485.
Davies, D. T., 92.
Davies, E., 477.
Davies, W. M., 239.
Davis, A. R., 23.
Davis, C. R., 605.
Davis, G. E., 399, 455.
Davis, G. H. B., 174.
Davis, H. L., 361.
Davis, I. G., 179.
Davis, J. E., 297.
Davis, J. J., 50.
Davis, J. S., 757.
Davis, L. L., 670.
Davis, N. C., 436.
Davis, R. H., 214.
Davis, R. L., 517, 525.
Davis, S. P., 723, 727.
Davis, W. C., 60.
Davis, W. H., 556, 697.
Davydov, P. N., 266.
Dawson, P. R., 546.
Day, P. L., 780.
De, D. C., 337.
Dean, F. P., 283.
Dean, F. W., 41.
de Andrés, C. G., 545.
Deanesly, R., 121.
Dear, P. S., 752.
Dearborn, R. B., 676.
de Blieck, L., 170.
Decker, A., 467.
Decker, C. J., 424.
Decker, G. C., 291, 567.
Decker, S. W., 685.
DeCoursey, R. M., 437.
Deen, E., 640.
DeGeer, C., 289.
DeJuhasz, K. J., 466.
de Kock, G. van der W., 70.
Delacour, J., 421.
DeLisle, R., 59.
Delwiche, E. J., 669, 674.
Demaree, J. B., 147.
De Meillon, B., 437.
de Mel, C. N. E. J., 155.
de Mello, T., 456.
Demerec, M., 498.
Demeritt, D. B., 534, 683.
Demidenko, T., 116.
Deming, G. W., 375.
Dempsey, P. W., 380.
Dencker, C. T., 175.
Deobald, H. J., 723.
de Oliveira, B. de, 274.
DeParavicini, E. D., 110.
de Pedro, D. S., 41.
Derby, H. A., 308.
de Reaumur, R. A. F., 289.
DeRose, H. R., 114.
de Souza, M. A., 455, 456.
DeTurk, E. E., 506.
Deubel, 78.
Deuber, C. G., 510.
Deuel, H. J., jr., 633.
Devereux, R. E., 214.
De Volt, H. M., 606.
DeVries, W. E., 615.
Dexter, S. T., 292.
Dey, P. K., 408.
DeYoung, W., 212.
Dharmalinga Mudaliar, S., 375.
Dible, J. H., 310.
Di Capua, A., 645.
Dice, J. R., 731.
Dickey, J. A., 183.
Dickey, M. G., 412.
Dickinson, L. S., 378.
Dickson, G. H., 681.
Dickson, J. G., 541, 543, 690, 691.
Dickson, R. E., 667, 750.
Didier, L., 315.
Diehl, H. C., 134, 425.
Diehl, W. W., 695.
Dienske, J. W., 105.
Dienst, 175.
Dietz, S. M., 399.
Dimock, W. W., 169.
Dingler, M., 285.
Dirks, C. O., 716.
Ditman, L. P., 558, 715.
Ditmars, R. L., 282.
Dixey, F., 172.
Dixon, E. D., 640.
Doak, K. D., 557.
Doan, C. A., 437.
Doan, F. J., 161.
Dodd, D. R., 29.
Dodds, H. H., 240.
Dodge, B. O., 702.
Doehlert, C. A., 524, 561.
Doflein, F., 282.
Dole, M., 861.
Dolgopol, V. B., 74.
D'Olier, A. A., 492.
Domontovich, M. K., 22.
Domontovitsch, M. K., 22.
Donahue, D. D., 320.
Donaldson, R. W., 378.
Donath, W. F., 770.
Donatien, A., 165.

Donelson, E., 475, 624, 625.
Doner, M. H., 706.
Dongé, E., 422.
Donham, C. R., 741.
Donnan, F. G., 356.
Doran, W. L., 399, 540.
Dorcas, M. J., 480, 490.
Dorman, R., 283, 425.
Doten, S. B., 427, 494.
Doucette, C. F., 559.
Dougherty, J. E., 611.
Douglas, W. A., 56.
Douglass, J. R., 155.
Dove, W. E., 282, 722.
Dowdle, V., 434.
Dowell, C. T., 850.
Down, E. E., 32, 34.
Downes, W., 284.
Downs, P. A., 305, 449.
Doyle, C. B., 518.
Doyle, L. P., 168, 299, 456.
Dozier, H. L., 57, 286, 439, 443, 558, 571.
Drabkin, D. L., 92.
Dragone-Testi, G., 660.
Drain, B. D., 385.
Draize, J. H., 738.
Drake, C. J., 150, 291, 424, 432, 567, 577.
Drake, N. L., 51.
Drechsler, C., 548.
Dreguss, M., 100, 105.
Driggers, B. F., 442, 560, 572.
Drummond, J. C., 631.
Duddy, E. A., 757.
Dudley, F. J., 302.
Duerden, J. E., 60.
Duffee, F. W., 723, 731.
Dufrenoy, J., 538, 689.
Duggan, M. M., 779.
Duguid, J. B., 779.
Dumbleton, L. J., 568.
Dunegan, J. C., 145, 275.
Dunkle, P. B., 665, 667.
Dunlap, G. L., 457, 748.
Dunlap, M. E., 686.
Dunlavy, H., 667, 690.
Dunn, L. H., 294, 431.
Dunn, S., 686.
Dunnam, E. W., 705.
Dunnewald, T. J., 16.
Du Pont, F. I., 325.
Dupré, E. F., 296.
Durand, P., 597.
Durant, A. J., 74, 457.
Durham, H. L., 305.
Duruz, W. P., 701.
Dustan, A. G., 430.
Dutcher, R. A., 185.
du Toit, P. J., 70.
Dutt, N. L., 374.
Dutton, W. C., 144.
Dvořák, K., 272.
Dwyer, R. E. P., 237, 405, 692.
Dye, J. A., 477.
Dye, M., 190.
Dyer, F. J., 200, 345.
Dyer, R. A., 248.
Dyer, R. E., 438, 577.
Dyke, H. B. van, 297.
Dykstra, T. P., 696.

Eastman, M. G., 333.
Eaton, O. N., 27.
Eberling, W., 423.
Eblen, M. D., 560.
Ebling, E. E., 754.
Echeverría, D. L., 41.
Eckerson, S. H., 39, 524.
Eckles, C. H., 303.
Eckstein, F., 285.
Eckstein, K., 285.
Eckstein, O., 113.
Eddins, A. H., 536, 544.
Eddy, C. O., 560.
Eddy, W. H., 88, 480, 776.
Edgar, R., 492.
Edgecombe, A. E., 538.
Edgecombe, S. W., 677.
Edgerton, C. W., 233, 263.
Edgington, B. H., 58, 69, 603.
Edmond, J. B., 245, 247.
Edson, A. W., 730.
Edwards, C. W., 639.
Edwards, D. C., 430.
Edwards, D. W., 366, 385.
Edwards, M. J., 506, 655.
Edwards, P. R., 169, 748.
Edwards, S. J., 599.
Eekelen, M. v., 501.
Ehlers, D. P., 321.
Eidel'man, Z. M., 116.
Eidmann, H., 284, 285.
Einset, O., 681.
Eisenmenger, W. S., 378.
Ekblaw, K. J. T., 324.
Eke, P. A., 614.
Elayda, A., 154.
Elbert, W., 661.
Elder, C., 70.
Ellenwood, C. W., 35, 43, 253, 425.
Elliott, C., 548, 688.
Elliott, H. S., 58.
Ellis, D. E., 233, 640.
Ellis, J. H., 211.
Ellis, N. R., 61.
Ellis, R. H., 389.
Elphick, G. K., 189.
Elton, C., 318.
Elvehjem, C. A., 90, 91, 348, 479, 723, 769.
Ely, R. T., 614.
Emack, E. P., 522.
Emden, F. van, 443.
Emerson, G. H., 198.
Emerson, P., 851.
Emerson, R. A., 497, 499.
Emme, H., 227.
Emmel, M. W., 318.
Emmerle, A., 501.
Emmert, E. M., 206, 362.
Enders, R. K., 420.
Engberg, R. C., 470.
Engelbreth-Holm, J., 747.
Engle, E. T., 121.
Englund, E., 470, 614.
Enke, G., 478.
Ensign, M. R., 516.
Enzie, W. D., 525, 674.
Eppson, H. F., 738.
Erb, J. H., 65, 69, 595.
Eriksson, J., 689.
Erlanson, E. W., 514.
Errington, P. L., 705.
Erwin, A. T., 385.
Erwin, L. E., 784.
Erygin, P. S., 372.
Esau, K., 381.
Espe, D. L., 447, 477.
Espinosa, J. C., 608.
Essig, E. O., 705.
Estiot, P., 422.
Euler, B. von, 630.
Euler, H. von, 482, 630.
Evans, H. M., 233, 773, 778.
Evans, M., 333.
Evens, P., 539.
Evvard, J. M., 295.
Ewart, A. J., 452.
Ewing, H. E., 49.
Eyster, W. H., 225.
Ezekiel, W. N., 406, 545, 546, 555, 690, 694.

Fabian, F. W., 5, 494, 746.
Fabey, J. E., 425.
Fahmy, T., 407.
Fairbank, J. P., 496.
Fairbanks, F. L., 330, 496.
Fairburn, D. C., 685.
Fajans, K., 356.
Falconer, J. G., 640.
Falconer, J. I., 331, 470, 613.
Falk, E. A., 87.
Fankhanel, W. R., 334, 610.
Fargo, J. M., 728.
Faris, J. T., 398.
Farley, A. J., 38, 560.
Farley, F. W., 445.
Farley, H., 315.
Farmer, R. S., 308.
Farnham, R. B., 524.
Farr, A. G., 86.
Farrar, C. L., 156.
Farrar, M. D., 560, 561, 563.
Farrington, E. I., 262.
Farris, N. F., 127, 378.
Farwell, G., 639.
Faull, A. F., 689.
Faull, J. H., 687.
Fawcett, H. S., 146, 147, 265, 277.
Fay, M., 186.
Fedorov, S. M., 151.
Fedotowa, T., 690.

Feldman, W. H., 310.
Fellers, C. R., 420, 473.
Fellows, H., 692.
Felt, E. P., 51, 559, 565, 566.
Fenske, M. R., 174.
Fenstermacher, R., 747.
Fenton, F. A., 705.
Fergus, E. N., 141.
Ferguson, W. S., 297.
Fernald, E. I., 131.
Fetterly, M., 185.
Fevold, H. L., 232.
Ficht, G. A., 55.
Field, A., 776.
Field, A. M., 770.
Fife, J. M., 568.
Filmer, R. S., 561, 580.
Finch, A. H., 684.
Fink, C. G., 785.
Fink, D. E., 570.
Fink, D. S., 669.
Finkelstein, M. H., 778.
Finnell, H. H., 270, 368, 380.
Firor, W. M., 120.
Fischer, E., 401.
Fish, F., 74, 457.
Fish, G. V., 11.
Fisher, C. B., 469.
Fisher, D. F., 554.
Fisher, R. A., 24.
Fisher, R. B., 340.
Fisher, S. J., 115.
Fiske, J. G., 35.
Fitch, C. P., 168, 312, 314, 741.
Fitch, J. B., 68.
Fite, A. B., 185.
Fitting, H., 20.
FitzGerald, D. A., 763.
Fitzpatrick, T. J., 235.
Flanigan, G. E., 187.
Fleming, C. E., 445.
Fleming, S. T., 639.
Fleming, W. E., 56.
Flemion, F., 21.
Fleshman, C. L., 448.
Fletcher, C. C., 19.
Fletcher, D. G., 48.
Fletcher, H. P., 385.
Fletcher, L. J., 496.
Fletcher R. K., 705.
Fletcher, T. B., 287.
Flint, O. S., 457.
Flint, W. P., 422, 560, 562.
Flor, L. H., 475.
Flory, W. S., jr., 374, 664.
Fluke, C. L., 282, 706.
Fogelson, S. J., 492.
Fogle, , 69.
Foister, C. E., 555.
Folsom, J. W., 706.
Forbes, E. B., 185.
Forbes, J. C., 199.
Forbes, W. T. M., 573.
Forman, L. W., 462.
Forsbeck, F. C., 696.
Fortuyn, A. B. D., 377.
Foss, E. S., 628.
Foster, A. L., 326.
Foster, P. C., 190.
Foster, W. A., 349.
Foster, W. D., 464.
Foter, M. J., 595.
Foulger, J. H., 207.
Fourie, P. J. J., 70.
Fowler, J., 614.
Fowler, R., 153.
Fowlie, P., 240.
Fox, H., 577.
Fox, R. H., 709.
Frame, B. H., 470.
Francioni, J. B., jr., 727.
Franck, W. J., 522.
Frank, A. H., 377.
Frank, B., 614.
Franklin, H. J., 385, 428.
Fraps, G. S., 109, 111, 113, 507, 657, 723, 740.
Fraser, E. B., 61.
Frazier, C. N., 482.
Fred, E. B., 5, 118, 645.
Freeborn, S. B., 576.
Freeman, W. G., 677.
French, A. P., 385.
Freney, M. R., 575.
Freudenberg, K., 646.
Freudenberg, W., 343.
Freundlich, H., 195.
Friederichs, K., 285, 419.
Friedman, M. H., 28.
Friedmann, H., 704.
Friend, R. B., 565, 716.
Friend, W. H., 306, 667, 673.
Frisak, A., 522.
Fritz, E., 398.
Fritz, W., 177.
Froker, R. K., 757.
Frolik, A. L., 125.
Frost, J., 332.
Frost, K. R., 329.
Frost, S. W., 54, 572.
Fry, E. S., 235.
Fudge, B. R., 555.
Fudge, J. F., 111, 690.
Fujita, A., 104.
Fuller, F. D., 724.
Fuller, G. L., 13.
Fuller, H. J., 386.
Fuller, J. E., 367.
Fulton, H. R., 555.
Funk, E. M., 62, 301, 445, 586.
Funnell, E. H., 483.
Furnas, S. M., 628.
Furr, J. R., 38.
Furry, M. S., 349.
Furth, J., 321.

Gabbard, L. P., 757.
Gabriel, F. M., 818.
Gaddum, J. H., 209.
Gaddum, L. W., 619.
Gaebler, O. H., 196.
Gaessler, W. G., 377.
Gaines, F., 262, 667, 678.
Gaines, J. C., 705.
Gaines, J. G., 424.
Gainey, P. L., 218, 219.
Gallman, T. B., 386.
Gallup, W. D., 296.
Galpin, C. J., 767.
Gammon, W. M., 234.
Garber, R. J., 24, 666.
Garcia, F., 94, 135.
Gardner, H. W., 125.
Gardner, J. C. M., 580.
Gardner, M. E., 684.
Gardner, M. W., 548, 697, 698.
Gardner, T. R., 582.
Gardner, V. R., 494.
Gardner, W. A., 544.
Gardner, W. U., 377.
Garlock, E. A., 755.
Garlough, F. E., 281.
Garman, C. G., 759.
Garrett, O. F., 449.
Garris, E. W., 244.
Garrison, E. R., 448.
Garstka, W. U., 686.
Garver, H. L., 175, 610.
Gaskill, E. F., 378.
Gassner, G., 691, 692.
Gaston, H. P., 526.
Gaston, T. L., 180.
Gäumann, E., 401.
Gauntt, F., 594.
Gaut, R. C., 291.
Gavrilescu, N., 344, 634.
Gay, C. W., 58.
Gebhardt, H. T., 67, 658, 735.
Geddes, W. F., 241, 242, 357.
Geib, H. V., 750.
Geiger, R., 211, 654.
Geiling, E. M. K., 120.
Geiszler, G. N., 667.
Gellborn, E., 508.
Gelpi, A. J., 732.
Georgeson, C. C., 353.
Gerasimov, A. M., 706.
Gerdel, R .W., 32.
Gerhardt, F., 373.
Gericke, A. M. M., 729.
Gerlaugh, P., 58, 297, 590.
Gersdorff, C. E. F., 3.
Gersdorff, W. A., 6.
Gerstenberger, H. J., 90.
Gerstley, J. R., 772.
Gerwe, E. G., 196.
Getchell, R. W., 6.
Ghosh, C. C., 286.
Gibbs, C. S., 72, 457.
Gibson, A., 428.
Gierke, A. G., 449, 745, 749.
Giersbach, J., 255.

Giese, H., 177, 178, 324, 385, 462.
Gifford, W., 448.
Gilbert, B. E., 350.
Gilbert, C. S., 440.
Gilbert, G. H., 548.
Gildehaus, E. J., 133, 386.
Gildow, E. M., 167.
Gill, J. B., 150.
Gilliam, A. E., 102, 341.
Gillen, G. F., 661.
Gillette, C. P., 53, 639.
Gilliatt, F. C., 436, 571.
Gillies, K., 425.
Gilman, H. L., 314.
Gilman, J. C., 263, 399, 662.
Gilman, V., 469.
Gilroy, E., 187.
Gilruth, J. A., 597.
Gines, F. G., 23.
Ginn, W. M., 729.
Ginsburgh, J. M., 560, 561, 574, 708.
Ginter, A. E., 493.
Gladwin, F. E., 136.
Glasgow, H., 424.
Glasgow, R. D., 427, 721.
Glassey, T. W., 109.
Glaves, A. H., 755.
Gleeson, G. W., 754.
Glendenning, R., 284.
Glenn, D. S., 611.
Glover, E. C., 560.
Glover, J. S., 458, 596.
Gloyer, W. O., 674, 681.
Glynne, M. D., 537.
Goddard, E. J., 276.
Godfrey, G. H., 557, 558.
Godkin, J. G., 538, 542.
Goedewaagen, M. A. J., 661.
Goff, C. C., 559.
Goffart, H., 402, 558.
Goke, A. W., 110.
Gokhalé, G. K., 597.
Goldblatt, H., 449.
Goldfarb, W., 633.
Golledge, H. C. D., 310.
Gonzaga, A. C., 168.
González de Andrés, C., 545.
Goodding, T. H., 127.
Gooderham, C. B., 440.
Goodey, T., 277,292.
Goodman, J. W., 640.
Goodman, R. B., 759.
Goodspeed, T. H., 376.
Goot, P. van der, 435.
Gordon, B., 489.
Gordon, W. S., 744.
Gore, U. R., 545.
Gorman, J. A., 726.
Goto, K., 143.
Gouaux, C. B., 233.
Gough, J., 779.
Gourley, J. H., 85, 132, 524.
Goverov, L. L., 131.
Graber, L. F., 126, 292.
Graf, S. H., 754.
Graham, G. L., 604.
Graham, N. P., 601.
Graham, R., 71, 72, 312, 460, 745, 747.
Grainger, J., 265, 268, 273.
Gramlich, H. J., 725.
Grams, W. T., 745.
Grange, L. I., 741.
Graut, D. H., 155.
Grant, F. M., 67, 178.
Grant, G. A., 65.
Grant, H. G., 574.
Grasovsky, V. S., 603.
Grasset, E., 452.
Gratz, L. O., 516, 550.
Graul, E. J., 669.
Graves, H. S., 351.
Graves, M., 614.
Gray, H. A., 464.
Gray, J. P., 238.
Gray, K. W., 712.
Gray, L. C., 179, 614, 757.
Gray, P. A., 349.
Gray, R. B., 496.
Gray, W. G., 41.
Graybill, H. W., 450.
Grayson, R. V., 102.
Grayzel, H. G., 88.
Greaves, J. E., 738.
Green, C. V., 231.
Green, E. L., 695, 770.
Green, J. R., 504.
Green, R. G., 72.
Greenberg, D. M., 4.
Greene, L., 252.
Greene, R. A., 112, 280, 519.
Greenhill, A. W., 157, 297.
Greenstein, J. P., 196.
Gregory, C. V., 614.
Gregory, D. W., 232.
Gregory, E. M., 727.
Greig, J. R., 744.
Grey, C. G., 459.
Griffith, M., 93, 637.
Griffiths, D., 514.
Griffitts, J. J., 436.
Griffitts, T. H. D., 436, 437.
Grimes, M. A., 781.
Grimes, W. E., 469.
Griswold, D. J., 722.
Griswold, G. H., 54, 566.
Groák, B., 103.
Groissmayr, F. B., 210.
Grönvold, H., 422.
Gross, J., 487.
Grossman, E. F., 226, 516, 559.
Grote, I. W., 8.
Groves, A. B., 374, 560.
Groves, L. S., 536.
Grundy, R. F. B., 324.
Grunsky, C. E., 366.
Guba, E. F., 399.
Gudjonsson, S. V., 477.
Guercio, G. del, 235.
Guha, B. C., 102, 186, 188, 344, 638.
Gui, H. L., 50, 439.
Guilbert, J., 200.
Guittonneau, G., 401.
Gulati, H. L., 44.
Gunderson, F. L., 159.
Gunn, D., 428.
Gunn, K. C., 141.
Gunness, C. I., 210, 385, 462, 654.
Gurin, C. Z., 88, 480, 776.
Güssow, H. T., 403.
Gustafson, A. F., 234.
Gustafson, C. R., 365.
Gustafson, F. G., 249.
Guterman, C. E. F., 417, 418.
Guthrie, J. E., 704.
Guyot, L., 542, 554.
Gwatkin, R., 166, 312, 313.
Gwin, C. M., 706.
Györgyi, A. S.-, 645, 649.

Haag, J. R., 723, 781.
Haas, A. R. C., 278, 684.
Haber, E. S., 248, 385, 473
Habu, Y., 733.
Hadden, F. C., 53.
Haddon, C. B., 28.
Hadley, A. H., 281.
Hadley, C. H., 565.
Hadley, F. B., 313, 740.
Haegele, R. W., 52.
Haenseler, C. M., 550.
Hagan, W. A., 192, 745.
Haig, I. T., 534.
Haigh, L. D., 223.
Hale, F., 723.
Hale, J. F., 446.
Hale, W. S., 732.
Hales, W. B., 107.
Haley, W. E., 57.
Hall, G. O., 301.
Hall, H. G., 667, 673, 782.
Hall, M. C., 597.
Hall, R. A., 667, 673, 723.
Hall, S. R., 388.
Hall, T. D., 235.
Hall, W. C., 445, 586.
Hall, W. J., 459.
Haller, M. H., 134, 389.
Halliday, N., 92, 359.
Halligan, C. P., 494.
Hallock, H. C., 577.
Halma, F. F., 532, 684.
Halpin, J. G., 728.
Halverson, J. O., 778.
Ham, A. W., 314.
Haman, R. W., 776.
Hamilton, C. C., 397, 561, 568.
Hamilton, C. M., 604.
Hamilton, H. G., 619.
Hamilton, J. M., 143, 552.
Hamilton, M. A., 537.
Hamilton, T. R., 338.
Hamilton, T. S., 626.
Hamlin, F. H., 177.

Hamly, D. H., 521.
Hammer, B. W., 306, 308, 447.
Hammer, O. H., 150, 719.
Hammil, W. J., 554.
Hammond, A. A., 434.
Hammond, J., 298, 724.
Hamner, B. L., 560.
Handley, C. O., 281.
Hanford, Z. M., 490.
Hanke, M. E., 490.
Hanks, J. H., 459.
Hanley, J. A., 236.
Hanna, W. F., 512, 544.
Hannon, R. R., 478.
Hansbrough, J. R., 148.
Hansen, A. H., 469.
Hansen, E. N., 462.
Hansen, N. E., 533.
Hansen, P. A., 734.
Hansen, T. S., 686.
Hanson, A. J., 425, 578.
Hanson, F. P., 496.
Hanson, H. C., 124, 259, 667.
Hanson, K. B., 318.
Harcourt, R., 234.
Harden, A., 201.
Harder, R., 20.
Harding, P. L., 390.
Hardman, G., 367, 462.
Hardy, A. V., 312.
Hardy, F., 352.
Hardy, J. I., 723.
Hardy, M. B., 682.
Hardy, W. T., 168, 740.
Harlan, J. D., 250, 253.
Harland, S. C., 227, 228.
Harley, C. P., 554.
Harman, S. W., 289, 526.
Harmon, F. N., 134, 680.
Harned, B. K., 198.
Harper, C., 158.
Harper, H. J., 220.
Harrington, F. M., 252.
Harrington, J. B., 129, 140, 230, 231.
Harris, E. S., 373.
Harris, H. C., 506.
Harris, H. M., 150, 432.
Harris, J. C., 307.
Harris, L. J., 650.
Harris, R. H., 357, 365.
Harrison, C. M., 32.
Harrison, G. J., 227.
Harrison, J. L., 463.
Harrison, L. P., 11.
Harrison, P. K., 283.
Hart, E. B., 91, 318, 348, 723, 731, 769.
Hart, W. J., 619.
Harter, L. L., 545.
Hartman, A. M., 781.
Hartman, C. G., 120, 377.
Hartman, E., 152, 711.
Hartman, S. C., 17, 239.
Hartzell, A., 595.
Hartzell, F. Z., 427, 574, 708, 710, 715.
Harukawa, C., 435, 579.
Harvey, E. N., 651.
Harvey, R. B., 130.
Haselhoff, E., 661.
Haseman, L., 424, 720.
Hashimoto, K., 451.
Hashitani, Y., 483.
Haskins, H. D., 114.
Hastings, E. G., 740.
Hastings, S. H., 128.
Hauch, J. T., 490.
Hauck, C. W., 80, 470.
Hauge, S. M., 59, 295.
Haun, F., 661.
Hausman, L. A., 49.
Haut, I. C., 261.
Hawk, P. B., 183.
Hawkins, L. A., 496.
Hawkins, L. E., 231.
Hawks, J. E., 622.
Haworth, W. N., 649.
Hawthorn, L. R., 673.
Hay, W. D., 522.
Hayden, C. C., 65.
Hayes, F. A., 110.
Hayes, H. K., 238, 351.
Hays, F. A., 446.
Hazelton, J. M., 445.
Hazen, M. W., 445.
Headlee, T. J., 38, 424, 560, 564, 713.
Headley, F. B., 300, 448.
Heald, F. D., 699.
Heard, C. E., 705.
Heath, L. M., 450.
Hebard, M., 429.
Hedgcock, G. G., 418.
Hedrick, U. P., 499, 525.
Hedrick, W. O., 471.
Heelsbergen, T. van, 318.
Heikertinger, F., 419.
Heilborn, O., 119.
Heilbron, I. M., 341, 501.
Heimpel, L. G., 234.
Heinbecker, P., 87.
Heinrich, C., 435.
Heinrich, G., 285.
Hell, H., 168.
Hellström, H., 630.
Helm, C. A., 378.
Helser, M. D., 444, 445, 725.
Hemmi, T., 267.
Henderson, C. N., 751.
Henderson, E. W., 444, 450.
Henderson, J. L., 733.
Henderson, W. J., 399, 548.
Henderson, Y., 769.
Hendrickson, A. H., 322, 683.
Hendrickson, B. H., 13, 750.
Hendrickson, C. I., 180.
Hendrickson, J. M., 171.
Hendrix, B. M., 196.
Henika, F. S., 515.
Hening, J. C., 164.
Henke, L. A., 444, 448.
Hennepe, te, 604.
Henning, G. F., 80.
Henny, D. C., 751.
Henricksen, H. C., 495, 525.
Henry, A., 75.
Henry, D. P., 310.
Henry, M., 576.
Hensley, H. C., 768.
Henson, E. R., 378.
Hepburn, G. A., 426.
Hepler, J. R., 524, 676.
Hepner, F. E., 12.
Herbert, F. W., 44.
Herbert, P. A., 615.
Hercus, C. E., 487.
Heriot, A. D., 283.
Herman, H. A., 448.
Herms, W. B., 565.
Herr, E. A., 50.
Herrick, G. W., 424, 566.
Herrick, H. T., 359.
Hervey, G. E. R., 153.
Hess, A. F., 487, 489, 491.
Hessler, M. C., 480.
Hetzel, R. D., 495.
Heukelekian, H., 751.
Heuser, W., 176.
Hewitt, E. A., 451.
Hibbard, B. H., 469, 757.
Hicks, W. H., 283.
Hienton, T. E., 303.
Higby, W. M., 118.
Higgins, F. L., 520.
Hilbert, K. F., 171.
Hildebrand, E. M., 690.
Hiley, W. E., 41.
Hill, C. C., 443.
Hill, F. F. 470.
Hill, H. O., 750.
Hill, J. A., 94.
Hill, J. B, 550
Hill, L. L., 709.
Hill, W. W., 657.
Hilton, G., 450.
Himwich, H. E., 633.
Hinds, W. E., 57, 156, 285, 714.
Hinman, E. H., 55, 190, 559.
Hinshaw, W. R., 749.
Hintikka, T. J., 548.
Hirst, E. L., 649.
Hissaw, F. L., 232.
Hitchcock, A. E., 245, 388.
Hitchner, E. R., 657.
Hixon, R. M., 402.
Hock, A., 12.
Hockenyos, G., 584.
Hockey, J. F., 680.
Hodgkiss, H. E., 561.
Hodgson, L., 741.
Hodgson, R. E., 448.
Hoeden, J. van der, 169, 741.

Hoefle, O. M., 522.
Hofer, A. W., 657.
Hoffer, C. R., 182.
Hoffman, A. C., 757.
Hoffman, G. P., 244.
Hoffman, G. W., 85.
Hoffman, H. A., 450.
Hoffman, I. C., 35, 132, 249.
Hoffman, M. B., 391, 678.
Hoffman, W. A., 705.
Hoffman, W. S., 205.
Hoffmann, W. E., 709.
Hofmann, F. W., 390.
Hogan, A. G., 445, 474, 480, 590, 591, 626, 646.
Hogentogler, C. A., 608.
Holben, F. J., 17.
Holbert, J. R., 508, 541.
Holdaway, F. G., 579.
Holden, J. A., 298.
Hole, N., 75, 749.
Holland, E. B., 378, 424.
Holland, S. L., 560.
Hollenbeck, F. S., 239.
Hollingshead, L., 664.
Hollingshead, R. S., 885.
Hollowell, E. A., 378.
Holm, J. E., 747.
Holmes, A. D., 63, 158.
Holmes, C. E., 723.
Holmes, C. L., 469, 614, 757.
Holmes, F. O., 550.
Holmes, R. H., 766.
Holmes, W. C., 654.
Holst, J. E., 4.
Holth, H., 456.
Holyński, S., 118.
Hönig, H. H., 628.
Hood, E. G., 162, 163.
Hootman, H. D., 392.
Hopkins, A. D., 210.
Hopkins, E. F., 35.
Hopkins, E. S., 234.
Hopkins, E. W., 657.
Hopkins, J. A., jr., 740, 760, 761.
Hoppe, P. E., 541, 544.
Hopper, I. V., 195.
Hopper, T. H., 667, 778.
Horesh, A. J., 90.
Hori, M., 286.
Horlacher, W. R., 638, 667, 723.
Horn, C. L., 518, 525.
Horn, M. J., 195.
Horne, A. S., 700.
Horsfall, J. G., 402, 412, 695.
Horton, J. S., 119.
Hotchkiss, C. H. B., 493.
Hotson, J. W., 266, 280.
Hotton, A. C., 261.
Hough, E. M., 767.
Hough, W. S., 283, 424, 590, 708.
Houghton, H. W., 462.
Housel, W. S., 463.
Houser, J. S., 49, 50, 424, 565.
Howard, L. O., 581.
Howard, P. E., 507.
Howe, P. E., 474.
Howell, A. H., 421.
Howell, K. M., 772.
Howells, D. V., 555.
Howitt, J. E., 234.
Howlett, F. S., 36.
Hoyt, H. R., 75.
Hu, C.-K., 482.
Hubbard, J. W., 33, 44.
Huber, L. L., 50.
Hubert, E. E., 419.
Hucker, G. J., 224.
Huckett, H. C., 710, 714, 716, 717.
Huddleson, I. F., 71, 166.
Hudson, C. B., 321, 747.
Hudson, C. S., 199.
Hudson, J. C., 464.
Hudson, J. R., 74, 168, 452.
Huffman, C. F., 594.
Hughes, H. D., 128, 377.
Hughes, J. S., 299, 448.
Hulbert, H. W., 243.
Hull, F. H., 226, 516.
Hülsenberg, H., 268.
Hultz, F. S., 726.
Hume, H. H., 560.
Humfeld, H., 112.
Hummel, B. L. 182.
Humphrey, E. N., 327.
Humphrey, G. C., 313.
Humphreys, W. J., 11, 366.
Humphries, A., 31.
Humphries, S., 31.
Hunscher, H. A., 475, 623, 624, 625.
Hunt, C. H., 58, 65, 88.
Hunt, L. W., 621.
Hunter, H. A., 275.
Hunter, H. C., 11.
Hunter-Smith, J., 125.
Huntington, A., 495.
Hurd, C. J., 736.
Hurst, C. C., 234.
Hurst, E. W., 71.
Hurst, R., 405.
Hurt, R. H., 699.
Huskins, C. L., 514.
Husmann, G. C., 259.
Hussong, R. V., 306.
Husted, L., 24.
Hutcheson, T. B., 668.
Hutchins, L. M., 700, 701.
Hutchins, W. A., 822.
Hutchinson, A. H., 409.
Hutchinson, H. P., 284.
Hutchinson, J. B., 227.
Hutchinson, W. G., 402.
Hutson, J. C., 426, 565.
Hutson, R., 53, 54, 57, 438.
Hyde, A. M., 618.
Hypes, J. L., 182.
Hyre, F. M., 784.

Ignacio Echeverria, D., 41.
Ijichi, S., 451.
Ikeda, S., 438.
Ikeda, T., 451.
Ilg, C., 560.
Imamura, S., 579, 710.
Immer, F. R., 24, 520, 521.
Ingerson, H. G., 561.
Ingham, L. W., 742.
Ingram, J. W., 56.
Innes, J. R. M., 650.
Irons, F., 177.
Irwin, H. S., 618.
Isbell, C. L., 37.
Isbell, H. S., 199.
Isely, D., 579.
Israelsen, O. W., 322, 823.
Itabashi, K., 451.
Ito, S., 451.
Ivanoff, S. S., 690.
Iverson, C. A., 164.
Iwanow, E. E., 121.
Iyer, P. R. K., 450, 746.

Jabouille, P., 421.
Jack, R. W., 435.
Jackson, A. D., 638.
Jackson, C., 70.
Jackson, C. M., 477.
Jackson, F. H., 463, 608.
Jackson, R. F., 208.
Jacob, A., 118.
Jacob, K. D., 205.
Jacobi, L., 326.
Jacobs, H. R. D., 205.
Jacoby, H. S., 754.
Jacotot, H., 315.
Jacques, A. G., 372.
Jaffé, R., 172.
Jagger, I. C., 269.
James, D. M., 561.
James, W. A., 72.
Jancke, O., 284.
Janes, M. J., 425.
Jankowska, K., 417.
Janssen, G., 541, 547.
Jaques, F. L., 421.
Jardine, J. T., 495, 782.
Jardine, W. D. D., 783.
Jared, D., 71.
Jarvis, E., 442.
Jarvis, H., 152, 291.
Jay, R., 450.
Jaynes, H. A., 57, 582, 714.
Jefferies, J. H., 528.
Jegen, J., 419.
Jehle, R. A., 275, 412.
Jemison, G. M., 366.
Jendrassik, A., 564.
Jenkins, A. E., 412, 553, 708.
Jenkins, J. M., 259, 260.
Jenkins, M. T., 377, 575.
Jenny, H., 216.

Jensen, J. M., 5.
Jensen, W. C., 615.
Jobitharaj, S., 375.
Joffe, J. S., 213.
Johann, H., 691, 694.
Johannsen, O. A., 566.
Johns, C. K., 162, 309.
Johnson, A. G., 543, 544.
Johnson, A. N., 463.
Johnson, B. K., 202.
Johnson, D. W., 587.
Johnson, E., 523.
Johnson, E. A., 209.
Johnson, E. P., 321, 603, 747.
Johnson, G. E., 148.
Johnson, H. W., 71.
Johnson, I. J., 238.
Johnson, J., 669.
Johnson, J. B., 753.
Johnson, J. M., 197.
Johnson, L. M., 625.
Johnson, M. J., 5.
Johnson, N. W., 180.
Johnson, O., 8.
Johnson, O. R., 470.
Johnson, P. H., 424.
Johnson, P. E., 667, 673.
Johnson, R. P. A., 263.
Johnson, S. D., 312.
Johnson, S. R., 445.
Johnston, C. O., 692.
Johnston, G. W., 589.
Johnston, S., 39.
Johnstone-Wallace, D. B., 236.
Jones, D. B., 3.
Jones, D. L., 262, 667, 673, 750.
Jones, E. E., 319, 422, 450.
Jones, E. T., 662.
Jones, F. R., 325, 698.
Jones, H. A., 246, 248.
Jones, H. R. B., 47, 48.
Jones, I. D., 528.
Jones, I. R., 731.
Jones, J. M., 665, 723, 727.
Jones, J. O., 133.
Jones, L. A., 496.
Jones, L. H., 273, 367, 385, 399.
Jones, L. K., 554.
Jones, M. L., 705.
Jones, P. A., 58.
Jones, R. W., 604.
Jones, S. E., 705.
Jones, W. A. P., 409.
Jones, W. L., 378.
Jones, W. W., 49, 558.
Jordan, C. F., 812.
Jørgensen, H., 388.
Jørstad, L., 408.
Josephs, H., 455.
Joslyn, M. A., 503.
Jugenheimer, R. W., 577.
Juhn, M., 122.
Jukes, T. H., 645.
Juliani, M., 660.
Jull, M. A., 26, 376.
Jurney, R. C., 18.

Kable, G. W., 329.
Kaburaki, T., 579, 710.
Kadam, B. S., 229.
Kagawa, F., 119.
Kahlenberg, O. J., 187.
Kaji, H. L., 787.
Kalandadze, L., 285.
Kalitaev, V. V., 384.
Kalitayev, V. V., 384.
Kalmbach, E. R., 322.
Kamenskii, K. V., 384.
Kamensky, K. W., 384.
Kanazawa, K., 737.
Kanda, S., 737.
Kane, E. A., 732.
Karper, R. E., 262, 515, 520, 667.
Karrer, P., 630.
Karsten, G., 20.
Kasahara, S., 104.
Kaufmann, O., 291.
Kauzal, G., 456, 601, 602.
Kawada, M., 534.
Kay, H. D., 205, 645.
Kay, W., 466.
Kearney, T. H., 227.
Kearns, H. G. H., 284.
Keating, F. E., 30, 723.
Keator, F. W., 77.
Keef, E. M., 450.
Keefer, C. S., 486.
Keeler, C. E., 376.
Keenan, J. A., 723.
Keifer, H. H., 423.
Keil, H. L., 87, 348.
Keim, F. D., 125.
Keitt, G. W., 552, 554, 690, 698.
Kellermann, W. F., 608.
Kelley, M. A. R., 496.
Kelley, V. W., 133.
Kellogg, R. S., 399.
Kellogg, W. K., 95.
Kelly, S. G., 576.
Keiser, R. A., 165.
Kelsheimer, E. G., 50, 568.
Kelty, R. H., 384, 424.
Keményffi, G., 504.
Kemmerer, A. R., 90, 348.
Kemner, N. A., 408.
Kempster, H. L., 301, 445, 586.
Ken, C., 72.
Kendall, E. C., 4.
Kendall, J., 225.
Kendall, J. C., 638.
Kennard, D. C., 58, 302, 303, 469, 593, 780.
Kennedy, J. W., 878.
Kern, R., 89.
Kernkamp, H. C. H., 318.
Kertesz, Z. I., 695.

Kesten, B., 599.
Kettering, C. F., 495.
Key, K. M., 189.
Keser, A., 128.
Khrebtov, A. A., 384.
Kick, C. H., 58.
Kidder, W., 126.
Kidson, E., 655.
Kiesselbach, T. A., 127.
Kifer, H. B., 630.
Kightlinger, C. V., 399.
Kik, M. C., 484.
Killough, D. T., 638, 667, 750.
Kimball, D. A., 251.
Kimball, H. H., 10, 11, 306.
Kimbrough, W. D., 233, 244.
Kime, P. H., 666.
King, B. M., 373.
King, C. G., 649, 650.
King, C. J., 11, 28, 35, 44, 94.
King, C. M., 377.
King, G. E., 389.
King, H. H., 429.
King, W. V., 288.
Kinghorne, J. W., 64.
Kingma, F. H. van B. T., 695.
Kingscote, A. A., 596.
Kinne, W. S., 754.
Kinnison, A. F., 396.
Kirby, R. S., 541.
Kirchhoff, H., 119.
Kirk, P. L., 196.
Kirkpatrick, E. L., 767.
Kirkpatrick, R. T., 378.
Kishi, Y., 531.
Kislanko, J. P., 150.
Kislikov, P. V., 131.
Kisslyakov, P. A., 131.
Kitselman, C. H., 741.
Kitsuta, K., 223.
Kittelberger, W. W., 80.
Klages, K. H., 128.
Klebahn, H., 694.
Klein, D., 62.
Klein, G., 364.
Kleine, R., 287, 419.
Kline, B., 723.
Kline, G. M., 364.
Kline, O. L., 723.
Kloth, W., 176.
Klotz, B. H., 502, 638.
Klotz, L. J., 146, 147, 277.
Klyver, F. D., 423.
Knapp, B., 689.
Knapp, B., jr., 26.
Knaysi, G., 737.
Knight, H., 570.
Knight, H. G., 614.
Knobel, E. W., 214.
Knott, J. C., 123.
Knott, J. E., 248.
Knowlton, G. F., 49, 429, 431, 568.

Knowlton, H. E., 391, 677, 678.
Knox, C. W., *27*.
Knox, J. H., 723.
Knudson, A., 636.
Kobayashi, K., *286*.
Kobel, M., 104.
Koeb, A., 284.
Koch, K., *292*, *706*.
Kochman, J., 703.
Kock, G. van der W. de, 70.
Koehler, A. E., 297.
Koehler, B., 693.
Koehne, M., 475, 480.
Koens, A. J., 129.
Köhler, G., 609.
Kohman, E. F., 88, 480, 770.
Kohn, G., 706.
Kolb, J. H., 767.
Kolle, W., 738.
Kolokolnikov, L. B., (Kolokol'nikov), 384.
Kon, S. K., 89, 485, 620.
Konakow, N., 284.
Konno, T., 451.
Konsuloff, S., 600.
Koonce, D., 375.
Köppen, W., 211, 654.
Körting, A., 284.
Kostoff, D., 225.
Kotte, W., 274, 694.
Kottur, G. L., 24.
Kozlowska, M., *770*.
Kozuma, T., 451.
Kramer, B., 88.
Kramer, L. M., 537.
Krämer, S., 261.
Kraus, R., 738.
Krauss, F. G., 239.
Krauss, W. E., 65, 448.
Kraybill, H. R., 522, 590, 631, 659, 697.
Krikorian, K. S., 451.
Krishna Iyer, P. R., 745.
Krishna, P. G., 118.
Krishnaswami, N., 26.
Křiženecký, J., 122.
Krueger, L. B., 471.
Krüger, F., 285.
Krümmel, H., 257.
Kubiena, W. L. W., 640.
Kugelmass, I. N., 486.
Kuhlman, G. W., 180.
Kühne, G., 468.
Kulgacheva, R. A., (Kul'gacheva), 706.
Kulp, M. R., 463.
Kumashiro, S., 435, 579.
Kumm, H. H. W., 436.
Kunhikannan, K., 286.
Kunike, G., 426.
Kunkel, L. O., 702.
Kuntz, P. R., 34, 549.
Kuntz, W. A., 585.
Kurerok, R., 282.
Küthy, A. von, 99.
Kuwana, I., 711.
Kuwayama, S., 286.

Lackey, C. F., 271, 549.
Lackey, J. B., 761.
Lackie, H. M., 281.
Lacroix, D. S., 383.
Lacy, H. E., 329, 330.
Lacy, I. O., 751.
Lacy, M. D., 724.
Ladd, C. E., 192, 613, 640.
Lagerlöf, N., 314.
Lahaye, J., 169.
Laing, F., 152, 573.
Laird, D. G., 657.
Lakela, O., 585.
Laland, P., 648, 649.
Lallemand, S., 512.
Lamb, A. R., 295.
Lamb, C. A., 521.
Lambert, E. B., 541, 695.
Lambert, W. V., 450.
Lammerts, W. E., 376.
Lamon, H. M., 64.
Lamson, P. D., 310, 750.
Landauer, A. B., 123.
Landauer, W., 123.
Landerholm, E. F., 180.
Lang, W. H., 20.
Langdale, E. H., 191.
Langford, G. S., 423, 714.
Langley, B. C., 667, 750.
Langord, L., 674.
Lanman, F. R., 336.
Lantow, J. L., 445, 761.
Lantz, H. L., 385, 677, 678.
Lanuza, E. A., 154.
Laquer, F., 101.
Larionov, D. K., 384.
Larmour, R. K., 241, 242.
Larson, C. A., 249.
Larson, R. H., 690.
Larson, V. S., 454.
Larsson, S., 60.
La Rue, C. D., 508.
Lathrop, A. W., 731.
Lathrop, F. H., 54, 55.
Latimer, L. P., 524, 678.
Lattig, H. E., 336.
Latzke, E., 770, 778.
Laude, H. H., 240.
Laurie, A., 36, 245.
Lavialle, P., 21.
La Voi, D. H., 446.
Layton, D. V., 390.
Leach, J. G., 407.
Leach, R., 45.
Leberl, E., 119.
Lebert, C. D., 428.
Leckenby, H. N., 425.
Leckie, R. B., 498.
LeCompte, E. L., 281.
Ledingham, G. A., 159.
Ledingham, J. C. G., 170.
Lee, H. A., 271.
Lee, L. L., 210, 524.
Lee, V. P., 615.
Leech, H., 284.
Leete, B. E., 41.
Leete, C. S., 734.
Lefebvre, C. L., 290.
Lefevre, C. L., 639.
Leggatt, C. W., 522.
Lehman, S. G., 548.
Lehmann, E. W., 607, 751.
Lehtisalo, T., 704.
Leichsenring, J. M., 475, 628.
Leifson, E., 312.
Leith, B. D., 669.
Lentz, J. B., 457.
Leonard, M. D., 289, 706, 710, 714.
Leonard, S. L., 232.
Leoncio, J. B., 405.
Leonian, L. H., 139.
Le Pelley, R. H., 431.
Lepik, E., 696.
Lepkovsky, S., 773, 778.
Leplae, E., 177.
Lerche, 321.
Lesné, E., 490.
Lestoquard, F., 165, 600.
Leukel, R. W., 138, 541, 543.
Leukel, W. A., 516.
Levchuk, . F., 706.
Levene, P. A., 198, 779.
Levine, H., 91, 777.
Levine, M., 373, 513.
Levine, M. N., 543.
Levtshuk, J., 706.
Lévy, G., 479.
Lewer, O. C., 303.
Lewis, E. A., 294, 452.
Lewis, E. B., 305, 725.
Lewis, E. P., 36.
Lewis, G. E., 126.
Lewis, G. G., 397.
Lewis, H. B., 769.
Lewis, I. P., 410.
Lewis, J. M., 482.
Lewis, M. R., 322, 606.
Lewis, M. T., 248.
Lewis, R. C., 93, 488.
Lewis, S. J., 629.
Lieben, F., 99.
Lienhardt, H. F., 299.
Life, C. S., 558.
Lill, J. G., 672.
Lilleland, O., 392.
Lillie, R. D., 438.
Lilly, C. A., 460.
Lilly, J., 584.
Lilly, J. H., 706.
Limbourn, E. J., 404.
Limson, M., 477.
Lindfors, T., 468.
Lindgren, D. L., 80, 572.
Lindgren, H. S., 728.
Lindinger, L., 419.
Lindquist, A. W., 588.
Lindquist, J. C., 294.
Lindroth, C. H., 425.

Lindsey, A. H., 471.
Lindsey, G. A., 662.
Lindsey, J. B., 378, 447.
Lindstrom, E. W., 378, 385, 399, 514.
Linford, M. B., 567.
Link, G. K. K., 270, 405, 538.
Link, K. P., 690.
Linser, H., 364.
Linsert, O., 201.
Lipman, J. G., 222, 505, 507, 517, 613, 614, 638.
Liro, J. I., 408.
Lisse, M. W., 452.
List, G. M., 558, 718.
Little, C. C., 497.
Little, H. F., 450.
Little, R. B., 744.
Liu, G., 717.
Livesay, E. A., 725.
Lloyd, J. W., 36, 765.
Lo, C.-S., 73.
Lobdell, R. N., 559.
Locke, S. B., 124.
Locklin, H. D., 258.
Lockwood, S., 423.
Löddesöl, A., 13.
Loew, E. R., 491, 777.
Loftin, U. C., 573.
Loh, T. C., 547.
Lohr, A., 11.
Lommel, W. E., 252.
Long, J. D., 178.
Longley, A. E., 374.
Longwell, B. B., 93.
Loo, T. L., 21.
Loomis, H. F., 11, 28, 35, 44, 94.
Lopez, A. W., 53, 562.
Lord, L., 229.
Loree, R. E., 191.
Lory, C. A., 462.
Lott, R. V., 529.
Loucks, K. W., 535.
Loughead, M. E., 473.
Love, L. D., 124.
Lovell, R., 599.
Lovern, J. A., 777.
Low, J. S., 385.
Lowe, B., 725.
Lowndes, J., 186, 634.
Lubbehusen, R. E., 321.
Lucas, P. S., 595.
Ludwig, C. A., 380.
Ludwig, D., 716.
Lund, E. J., 687.
Lunden, A. P., 228.
Lush, J. L., 304, 444, 724.
Lush, R. H., 303, 782.
Lusk, G., 769.
Lusk, J. P., 548.
Lute, A. M., 126.
Luthra, J. C., 290.
Lüttringhaus, A., 201.
Lutz, J. M., 532.
Lyle, E. P., 496.
Lynde, C. J., 493.
Lyon, M. E., 522.
Lyon, T. L., 18.

McAlister, J. T., 611.
McAlister, L. C., jr., 558.
MacAloney, H. J., 439.
McAlpine, J. G., 597.
McArdle, R. E., 373, 512.
McAtee, W. L., 420.
McBirney, S. W., 177.
McBride, C. G., 83.
McCall, P. B., 424.
McCall, R., 495.
McCallan, S. E. A., 547.
M'Callum, A., 767.
McCapes, A. M., 314.
McCarter, J., 740.
McCarthy, T., 716.
McCaughey, W. J., 464.
McCay, C. M., 589, 770.
McCleery, F. C., 416, 417.
McClellan, W. S., 87, 478.
McClelland, C. K., 34.
McClelland, T. B., 517, 525, 532, 638.
McClintock, B., 225, 513.
McClure, G. M., 29.
McConkey, O., 237.
McConnell, H. S., 423, 582.
McCool, M. M., 15.
MacCormick, A. H., 474.
McCoy, E., 118.
McCue, C. A., 472.
McCuen, G. W., 75.
McCulloch, E. C., 740.
McCullough, C. B., 608.
McDaniel, E. I., 54, 433, 566, 705.
McDonald, A. H. E., 609.
McDonald, F. G., 503.
MacDonald, G. B., 398.
McDonald, W. F., 11.
McDougle, H. C., 457.
McDougle, H. S., 74.
McDowall, F. H., 164.
McDowell, C. H., 667, 673, 690.
McFadyean, J., 740.
McGaughey, C. A., 170, 602.
McGeorge, W. T., 370.
MacGill, E. I., 431.
McGinnies, W. G., 124.
McGovran, E. R., 567.
McGowan, E. B., 349.
McGowan, J. P., 845.
McGregor, E. A., 50, 443.
McGregor, W. G., 238.
McGuire, L. P., 415.
McHargue, J. S., 489.
Macht, D. I., 232.
McIntosh, A. E. S., 240, 852.
McIntosh, C. W., 450.
McIntosh, R. A., 596.
McIntyre, A. C., 533, 534.
Mack, M. J., 447.
Mack, P. B., 492, 781.
Mack, W. B., 220.
McKaig., N., jr., 672.
McKay, H., 87, 336, 337, 622.
McKay, M. B., 606.
McKenzie, F. F., 376.
McKenzie, K. A., 675.
Mackey, A. K., 723.
McKibben, E. G., 326.
Mackie, D. B., 423, 705
Mackie, W. W., 267.
McKinley, A. D., 31.
Mackintosh, J., 731.
Maclagan, D. S., 429.
McLaughlin, F. A., 522.
McLaughlin, J. B., 29.
McLaughlin, W. W., 496.
McLean, E. E., 470.
MacLeod, F. L., 159.
MacLeod, G., 483.
MacLeod, J. 744.
McLester, J. S., 337.
Macloon, E. R., 159.
McMillin, H. R., 620.
McMurtrey, J. E. jr., 511.
McNall, P. E., 757, 767.
McNess, G. T., 667.
McNulty, J. B., 65.
McNutt, G. W., 71.
McNutt, S. H., 454, 734.
Macy, H., 68.
Macy, I. G., 475, 623, 624, 625, 769.
Magee, C. J. 697, 701.
Magill, W. W., 560.
Magness, J. R., 38, 134.
Magnuson, H. P., 254.
Magnusson, H., 742.
Magoon, C. A., 675.
Magruder, R., 246.
Mahan, W., 30.
Mahan, W. D., 303.
Mahoney, C. H., 191.
Maignon, F., 185.
Mains, E. B., 266, 556, 691, 692, 697.
Malcolm, W. G., 739.
Malik, L. A., 30.
Malkani, P. G., 168.
Malkov, F. I. (Mal'kov), 384.
Mallamaire, A., 696.
Mallmann, W. L., 170, 449.
Malloch, J. G., 241, 242.
Mallon, M. G., 625.
Malmsten, H. E., 124.
Malyshev, S. J., 441.
Malysheva (Malyshev), E. V. P.-, 706.
Mamonov, B. A., 706.
Manahan, M., 337.
Maneki, M., 444, 448.
Maney, T. J., 385, 389.
Mangels, C. E., 667.
Mangelsdorf, P. C., 225, 513, 667.

Mann, A. B., 498.
Mann, A. Z., 182.
Manning, R. I., 96.
Manny, T. B., 470.
Manuel, H. L., 701.
Manwell, R. D., 743.
Mapson, L. W., 635.
Marallhalli, S. S., 24.
Marble, D. R., 301.
Marcovitch, S., 50, 561, 569.
Marek, J., 598, 599.
Marker, R. E., 198.
Markuze, Z., 620.
Marloth, R. H., 23.
Marquardt, A. R., 218.
Marquardt, J. C., 305, 306, 735.
Marsais, P., 46.
Marsh, G. L., 503.
Marsh, R. W., 413, 414, 552, 553.
Marshall, F. H. A., 724.
Marshall, M. S., 71.
Marshall, R. C., 48.
Marshall R. E., 10, 392, 611.
Marston, A. R., 33.
Marston, H. R., 726.
Marth, P. C., 390.
Martin, C. L., 596.
Martin, E. D., 69.
Martin, J. W., 598.
Martin, L. C., 202.
Martin, W. H., 38, 536, 544, 551.
Martinaglia, G., 740.
Martini, E., 285.
Martini, M. L., 266.
Martins, T., 120.
Marvin, C. F., 351, 366.
Marvin, G. E., 653, 706, 721.
Mason, J. H., 73.
Massee, A. M., 156, 157.
Massey, L. M., 418.
Massingham, H. J., 281.
Masure, M. P., 387.
Matheson, C., 49.
Mathews, F. P., 740.
Mathews, J. A., 208.
Mathews, O. R., 124.
Matsumoto, T., 137, 147.
Matsumura, S., 426.
Mattson, S., 219, 640.
Maughan, F. B., 709.
Maughan, G. H., 185, 780.
Maurer, S., 188.
May, C., 43.
May, O. E., 359.
Mayer, E., 492.
Mayhew, R. L., 313, 458.
Maynard, J. G., 411, 413, 414.
Maynard, L. A., 589, 770.
Mayne, B., 437.
Mayne, W. W., 146.
Mazé, P., 539.
Mead, E., 496, 613.
Meade, DeV., 742.
Meckler, C. M., 662.
Megee, C. R., 384.
Mehring, A. L., 519.
Meillon, B. De, 437.
Meinertzhagen, R., 149.
Mel, C. N. E. J. de, 155.
Melander, A. L., 423.
Melhus, I. E., 143, 399, 548, 551.
Mell, R., 285.
Mello, T. de, 456.
Menard, D. F., 158.
Mendel, L. B., 621, 769, 773.
Mendiola, N. B., 359.
Mendiola, V. B., 406.
Menefee, E. R., 764.
Menozzi, A., 195.
Mensching, J. E., 220.
Mercer, R., 126.
Mercker, A. E., 332.
Merkel, L., 141.
Merriam, O. A., 477.
Merrill, R. M., 177.
Merriman, M., 754.
Mervine, E. M., 610.
Merwe, C. P. van der, 426.
Merwe, C. R. van der, 242, 243.
Meske, A. E., 560.
Metcalf, C. L., 422, 716.
Metzger, F. W., 155.
Metzger, J. E., 672.
Meurs, A., 697.
Meyer, A. H., 222, 233, 322.
Meyer, A. R., 747.
Meyer, A. W., 364.
Meyer, E., 284.
Meyer, K., 233.
Meyer, K. F., 486.
Meyer, L. J., 418.
Meyer, M. H., 771.
Meyerhof, O., 620.
Mezzadroli, G., 20.
Michael, V. M., 460.
Michaelis, L., 197.
Middleton, A. D., 148.
Middleton, R. M., 185.
Middleton, W., 441, 565.
Midgley, T., 496.
Miège, E., 240.
Miessner, 604.
Miles, H. J., 640.
Miles, H. W., 273, 437, 441.
Miles, L. E., 147.
Miller, C. D., 472.
Miller, D. F., 437.
Miller, E. C., 366.
Miller, E. G., jr., 292.
Miller, E. R., 11.
Miller, F. W., 560, 640.
Miller, H., 608.
Miller, H. G., 124.
Miller, H. K., 92, 321.
Miller, I. M., 288.
Miller, J. C., 283, 244.
Miller, L., 627, 775.
Miller, M. F., 367.
Miller, M. R., 445.
Miller, N. C. E., 151.
Miller, N. J., 734.
Miller, P. L., 180, 470.
Miller, P. W., 552.
Miller, R. C., 185.
Miller, R. F., 158, 232.
Miller, T. A. H., 350.
Miller, W. S., 357.
Mills, A. S., 289.
Mills, E. M., 420.
Mills, I., 650.
Mills, P. J., 263.
Mills, R. H., 450.
Mills, W. D., 552.
Milner, M., 770.
Minett, F. C., 599.
Mirchandani, T. J., 17.
Mirimanian, K. P., 18.
Mitchell, C. A., 72, 313, 450.
Mitchell, D. R., 757.
Mitchell, D. T., 596.
Mitchell, F. A., 222.
Mitchell, H. H., 63, 183, 627, 628.
Mitchell, H. S., 627, 775.
Mitchell, J., 215, 219.
Mitra, M., 42.
Mitter, J. H., 45.
Mix, A. J., 539, 556.
Miyawaki, A., 737.
Mochida, I., 451.
Moe, L. H., 453.
Moffet, H. C., 445.
Mohr, J. C., van der M., 150.
Mohr, O. L., 499.
Mohri, R. W., 165.
Mokrzecki, Z., 712.
Mönnig, H. O., 70.
Monobe, S., 531.
Monroe, C. F., 95, 303, 448.
Montfort, P. T., 331.
Montgomerie, R. F., 605.
Montgomery, M. F., 89.
Montzheimer, J. W., 338.
Moomaw, L., 518, 667.
Moore, D. L. R., 189.
Moore, D. M., 398.
Moore, H. C., 191, 595.
Moore, H. R., 80.
Moore, J. C., 680.
Moore, J. G., 674.
Moore, J. M., 64.
Moore, L. A., 504.
Moore, M. H., 418.
Moore, T., 188, 301, 646.
Moore, W., 705, 718.
Morelle, J., 485.
Morey, H. F., 534, 698.
Morgan, A. F., 776.
Morgan, E. L., 472.

Morgan, G., 300.
Morgan, G. W., 518.
Morgan, H. de R., 170.
Morgan, M. F., 105.
Morgan, R. L., 127.
Morgan R. S., 646.
Morgan, T. H., 498.
Morison, C. B., 337.
Morison, C. G. T., 14.
Morison, F. L., 80.
Morita, H. T., 557.
Moritz, O., 48.
Moroshkina, O. S., 706.
Morrill, A. W., 705.
Morris, A. J., 731.
Morris, H., 169, 313
Morris, H. F., 667, 673.
Morris, H. P., 587.
Morris, R. S., 629.
Morris, V. H., 29, 208, 660.
Morrison, H. B., jr., 68.
Morrow, E. B., 682.
Morse, F. W., 367.
Morstatt, H., 408.
Mortensen, E., 667, 673, 758.
Mortenson, W. P., 334.
Mortimer, G. B., 669.
Morton, G. E., 59.
Morton, R. A., 102, 200, 341, 501.
Moses, B. D., 496, 611.
Moses, D., 235.
Mosher, M. L., 180.
Moss, W. A., 234.
Mossop, M. C., 565.
Mote, D. C., 425, 712.
Moulton, D., 480, 709.
Mounce, F. C., 40, 524.
Moutia, A., 562.
Mowy, H., 523.
Moznette, G. F., 150.
Mudaliar, S. D., 375.
Mueller, W. S., 447.
Muesebeck, C. F. W., 584.
Mugrage, E. R., 488.
Mulay, A. S., 255.
Mulford, F. L., 685.
Muller, H., 476.
Mulligan, B. O., 544.
Mumford, F. B., 223, 494.
Mumford, H. W., 614.
Münch, E., 589.
Muncie, J. H., 539, 542.
Mundinger, F. G., 705, 709, 715.
Mundkur, B. B., 24.
Mungomery, R. W., 150.
Munn, M. T., 130, 522.
Munro, J. A., 156, 705.
Munsell, H. E., 630.
Murari, T., 445.
Murdock, H. E., 822.
Murnane, D., 597.
Murneek, A. E., 244, 272, 896.
Murphy, D. F., 53.
Murphy, H. F., 220.
Murphy, L. S., 615.
Murray, C., 444, 450, 454, 734.
Murray, C. W., 425.
Murphy, H. C., 399.
Murray, W. G., 462, 470.
Murray, W. S., 377.
Musbach, F. L., 657.
Mussehl, F. E., 447, 729.
Musselman, H. H., 496.
Myers, J. T., 598.
Myers, J. W., 448.
Myers, K. H., 180.
Myers, R. P., 734.
Myers, V. C., 346, 347, 769.

Naftel, L. A., 16.
Nagel, B. R., 772.
Nagle, M. E., 522.
Nagy, V. L., 100.
Naik, R. N., 451.
Naito, M., 286.
Nakamura, J., 451.
Nambu, H., 395.
Naqvi, S. N., 107.
Narasimhamurty, N., 48.
Narayanan, T. R., 25.
Nazareth, B., 229.
Neal, D. C., 141, 546.
Neal, J. H., 322, 607.
Neal, N. P., 674.
Neal, W. M., 593.
Neale, P. E., 298.
Nebel, B. R., 131.
Nebel, M. R., 495.
Neel, L. R., 129.
Neiswander, C. R., 50.
Neiswander, R. B., 50, 425.
Neitz, W. O., 70.
Nelson, C., 448.
Nelson, E. M., 481.
Nelson, E. W., 124.
Nelson, H. C., 676.
Nelson, L. W., 229.
Nelson, M., 669.
Nelson, M. Van K., 340.
Nelson, P. M., 385, 445, 473, 725.
Nelson, T. C., 558.
Nelson, V. E., 87, 348.
Nessler, H.,, 669.
Netherland, W., 614.
Neuberg, C., 104.
Newcomer, E. J., 152, 283, 425, 561.
Newell, H. M., 765.
Newell, W., 560, 638.
Newhall, A. G., 44, 551.
Newman, B. H., 574.
Newman, H. H., 282.
Newman, L. H., 242.
Newsom, I. E., 744.
Newton, G. A., 554.
Nice, M. M., 281.
Nicholls, W. D., 179.
Nichols, H. E., 678.
Nichols, P. F., 255, 611, 776.
Nicholson, E. M., 420.
Nickels, C. B., 55.
Nickerson, D., 335.
Nicolaisen, N., 36.
Nielson, O., 408.
Niemann, K. W., 749.
Nieschulz, O., 171.
Niethammer, A., 44, 266, 509, 539.
Nieves, R., 268.
Nighbert, E. M., 168.
Niitsu, H., 257.
Nikiforoff, C. C., 211.
Niklas, H., 12.
Niles, B. E., 560.
Nilsson, G., 609.
Nims, B., 475, 623, 624, 625.
Nisikado, Y., 269.
Noble, N. S., 583.
Noble, W. B., 435.
Nohmi, S., 451.
Nolan, W. J., 581, 705.
Nolla, J. A. B., 525, 550, 694.
North, D. S., 271.
North, G. C., 731.
North, H. F. A., 24.
Norton, E. A., 506.
Norton, J. E., 518.
Notley, F. B., 430.
Nourse, E. G., 757.
Nowell, W., 702.
Nuckols, S. B., 34, 549.
Nygard, I. J., 370.

O'Brien, D. G., 408, 543.
Ochi, Y., 451.
Ochs, G., 287.
Ochse, J. J., 246.
Odell, C. B., 10, 11.
O'Dell, J. H., 428.
Odén, S., 115, 609.
Odland, T. E., 666.
Oertel, E., 720.
O'Flaherty, F., 437.
Ogden, W. B., 689.
Ogilvie, L., 405, 544, 558.
Ohsaki, M., 254, 257.
Okabe, N., 147.
Okamoto, H., 286.
O'Kane, W. C., 429, 560, 562.
Okuda K., 451.
Olitsky, P. K., 696.
Oliveira, B. de, 274.
Oliver, A. W., 728, 763.
Oliver, C., 733.
Olney, R., 496.
Olofsson, N. E., 60.
Olsen, N. A., 618.
Olsen, O. W., 429.
Olson, T. M., 158, 159, 181.

Olstad, O., 148.
O'Neal, A. M., 214, 233.
Ongaro, D., 661.
Onissimowa, Z., 284.
Ono, S., 451.
Orchard, O. B., 244.
Orten, J. M., 488.
Ortloff, H. S., 398.
Osborn, J. B., 137.
Osborne, T. B., 96.
Oser, B. L., 183.
Osland, H. B., 59.
Osmun, A. V., 385.
Osterberger, B. A., 57, 283.
Osterhout, W. J. V., 372, 373, 511.
Otanes, F. Q., 438.
Otuka, Y., 252.
Overholser, E. L., 252, 257, 393, 425, 528, 677, 681.
Overholt, V. L., 75.
Overley, F. L., 252, 257, 425, 677, 681.
Overman, O. R., 449.
Overpeck, J. C., 380.
Ow, Von, 327.
Owen, O., 387.
Owen, W. L. jr., 705.
Ower, J. J., 316.
Oxer, D. T., 73, 600.
Oxspring, G. E., 451.

Pack, H. J., 427, 434.
Paddock, F. B., 156.
Padget, P., 780.
Pagden, H. T., 158.
Page, H. J., 297.
Painter, W. E., 448.
Pairpoint, N. M., 421.
Palkin, S., 9.
Palm, C. E., 578.
Palmer, E., 603.
Palmer, F. C., 80.
Palmer, M. A., 53.
Palmer, R. C., 552.
Palmiter, D. H., 690.
Palo, M. A., 707.
Pammel, L. H., 276.
Papanicolaou, G. N., 233.
Paranjpé, A. S., 597.
Parfitt, E. H., 95.
Pariente, A. C., 647.
Park, O. W., 424, 720.
Park, S. E., 312.
Park, T., 579.
Parker, H. L., 57.
Parker, J. R., 151, 567.
Parker, K. W., 661.
Parker, M. M., 674.
Parker, R. G., 389.
Parker, R. R., 455.
Parker, W. H., 31.
Parkes, A. S., 121.
Parkin, B. S., 70.
Parks, H. B., 705, 720.
Parks, T. H., 424, 425.
Parrott, P. J., 427, 561, 572, 708.
Parshall, R. L., 606.
Parsons, B., 418.
Parsons, H., 769, 776.
Parsons, K. H., 759.
Parsons, L. G., 90.
Parsons, M. S., 617.
Partridge, N. L., 37.
Pasinetti, L., 690.
Passalacqua, T., 703.
Patch, A. J., 494.
Patel, M. K., 265, 538, 539.
Paterson, N. F., 293.
Paton, R. R., 41.
Patterson, F. D., 444, 450.
Patterson, H. J., 638.
Patton, C. A., 12.
Pauli, W., 99.
Paulson, W. E., 757.
Pavarino, L., 414.
Peabody, L. E., 77.
Peairs, L. M., 149.
Pearce, G. W., 288, 526, 527.
Pearsall, W. H., 134.
Pearson, F. A., 469.
Pearson, J. H., 768.
Pearson, T. G., 149.
Peck, M., 470, 614.
Pedro, D. S. de, 41.
Peet, C. H., 53.
Peet, L. J., 493.
Pelley, R. H. Le, 431.
Peltier, G. L., 379.
Penau, H., 200.
Pencharz, R. I., 233.
Pentzer, W. T., 134.
Pepper, B. B., 572.
Percival, G. P., 505, 524, 527, 653.
Perkins, A. E., 65.
Person, L. H., 263.
Pescott, R. T. M., 291.
Petch, C. E., 56.
Peters, R. A., 344, 634.
Petersen, W. E., 451.
Peterson, A., 424.
Peterson, A. R., 654.
Peterson, J. B., 658.
Peterson, W., 613.
Peterson, W. H., 5, 645.
Petit, G., 420.
Petre, A. W., 697.
Petri, L., 268, 279, 512.
Pettey, F. W., 718.
Pettigrove, H. R., 191.
Pettit, R. H., 53, 54, 55.
Pfaffman, G. A., 450.
Philip, C. B., 456, 574.
Phillips, E. F., 156, 427, 561.
Phillips, M., 206, 247.
Phillips, R. W., 376.
Phillips, S. W., 214.
Phillips, T. G., 658.
Philpot, J. St. L., 201.
Phipps, C. R., 716.
Piao, S., 72.
Pichard, G., 256.
Pickard, J. N., 420.
Pickels, G. W., 76.
Pickett, B. S., 385.
Pickles, A., 151.
Pickrell, K. P., 761.
Pickwell, G. B., 422.
Pieper, J. J., 670.
Pierce, L., 275, 700.
Pierce, W. D., 271.
Pierce, W. H., 690.
Pierstorff, A. L., 692.
Pieters, A. J., 127, 380.
Pigorini, L., 659.
Pigott, M. G., 63, 158.
Pilling, M., 134.
Piper, W. E., 427.
Piston, D. S., 654.
Pistor, W. J., 450.
Pittman, B. C., 782.
Pittman, H. A., 402, 404, 407, 409, 413.
Plagge, H. H., 385, 391.
Plakidas, A. G., 143, 263.
Plastridge, W. N., 170, 312, 597.
Plath, C. H., 667, 722.
Platt, C. S., 64, 729.
Platz, G. A., 267.
Plice, M. J., 204.
Plimmer, R. H. A., 186, 634.
Plum, M. M., 594.
Plummer, P. J. G., 450.
Plunkett, H., 767.
Plunkett, O. A., 280.
Polak, A., 482.
Polivka, J. B., 50.
Pollinger, W. E., 252.
Polowzow, W., 27.
Polson, B. A., 183, 767.
Pomeroy, C. S., 134, 665, 680.
Pond, G. A., 78, 757, 758.
Pool, W. A., 167.
Pool, W. O., 61.
Poole, R. F., 550.
Poore, H. D., 100, 622.
Poos, F. W., 710.
Pope, M. N., 371.
Pope, W. T., 385.
Popham, F. J., 174.
Porte, W. S., 387.
Porter, B. A., 425.
Porter, D. R., 143, 551.
Porter, R. H., 377, 399, 647.
Potter, E. L., 726, 768.
Potter, G. F., 524, 527.
Potter, M. C., 115.
Potter, M. T., 647.
Potts, R. B., 361.
Powell, M. E., 448.
Powers, L., 663.
Powers, W. L., 112, 323, 655, 750.

Pratolongo, U., 203.
Pratt, G. D., 614.
Prell, H., 285.
Prentice, E. G., 408, 548.
Prescott, S. C., 446.
Price, F. E., 736.
Price, W. A., 560.
Price, W. V., 309, 731, 757.
Prickett, L. C., 79.
Prickett, P. S., 734.
Pridham, A. M. S., 261.
Pridham, J. T., 405, 692.
Priesner, H., 289, 442, 567.
Prince, A. L., 507.
Prince, F. S., 505, 517.
Pritchard, F. J., 387.
Procter, B. C., 586, 626, 627.
Prokanov, Д., I. (Y). 130.
Pulles, H. A., 167.
Punnett, R. C., 26.
Purchase, H. S., 75.
Puri, A. N., 212.
Puri, D. R., 570.
Purwin, P., 454, 734.
Pussard-Radulesco, E., 288.
Puzanova-Malysheva, E. V., (Puzanov-Malyshev), 706.
Pyenson, L., 577.

Quattrocchi, A., 397.
Quayle, H. J., 432.
Quested, J. E., 158.
Quillico, A., 645.
Quin, J. I., 70.
Quinby, J. R., 667, 673.
Quinn, J. P., 26, 376.

Rademacher, B., 426, 693.
Rader, L. F., jr., 205.
Radsma, W., 474.
Radulesco, E. P.-, 288.
Rafferty, C., 347.
Ragsdale, A. C., 445, 448, 586.
Rahn, O., 738.
Ralli, E. P., 647.
Ramakrishna Ayyer, T. V., 289.
Ramiah, K., 375.
Ramsey, G. B., 279, 405.
Ramsey, R. J., 66.
Rands, R. D., 272.
Rankin, A. C., 316.
Rankin, J. O., 190.
Rao, M. K. V., 264.
Rao, P. K., 25, 26.
Rasmussen, E. J., 524, 560, 680.
Rasmusson, J., 228.
Ratcliffe, F. N., 352, 420.
Rather, H. C., 34.
Rattray, J. M., 403.
Rauchenstein, E., 82, 615.
Rawson, G. W., 452.
Ray, C. L., 11.
Ray, P., 382.
Raymond, W. H., 186, 684.
Raymore, H. B., 398.
Rayner, J. A., 461.
Rea, H. E., 509, 546, 667, 690.
Read, L. H., 31.
Read, W. H., 244.
Ream, H. W., 126.
Reaumur, R. A. F., de, 289.
Rebrassier, R. E., 69, 746.
Record, P. R., 58, 730.
Reddy, C. S., 377, 390, 548.
Reder, R., 296.
Reed, C. O., 408, 496.
Reed, F. D., 446, 613.
Reed, G. B., 599.
Reed, G. M., 139.
Reed, H. J., 638, 667, 673, 782.
Reed, H. M., 255.
Reed, I. F., 755.
Reed, L. L., 773.
Reed, R. H., 328.
Reed, S., 335.
Reed, T. W., 700.
Reerink, E. H., 103.
Rees, C. W., 311, 597.
Reese, C. A., 156.
Reeves, E. L., 554.
Reeves, R. G., 513.
Regan, W. M., 576.
Regan, W. S., 572.
Reh, L., 419.
Reichelt, K., 36.
Reichenow, E., 282.
Reichert, F. L., 233.
Reid, W. H. E., 448.
Reineke, L. H., 688.
Reinhard, E. G., 581.
Reinhard, H. J., 576, 705.
Reinmuth, E., 270.
Reis, F., 105.
Remington, R. E., 91.
Renne, R. R., 332.
Reschke, J., 629.
Ressovsky, N. W. T.-, 232.
Rettger, L. F., 170, 459, 769.
Reusser, H. W., 16.
Reynard, C., 280.
Reynolds, E. B., 546, 667.
Reynolds, R. J. W., 649.
Reynolds, S. R. M., 121.
Rhoades, M. M., 226, 513.
Rhoads, A. S., 535.
Rhumbler, L., 285.
Ricaud, 743.
Rice, C. E., 599.
Rice, P. L., 290.
Rich, C. E., 203.
Rich, T. S., 461.
Richards, O. W., 287.
Richardson, C. H., 424.
Richardson, H. H., 558, 722.
Richardson, J. E., 637.
Richardson, L. R., 480.
Richardson Kuntz, P., 34.
Richey, H. W., 136, 683.
Richmond, B. G., 148.
Ricks, J. R., 518, 638, 640.
Riddell, W. H., 448.
Riddle, O., 122.
Riesch, A. von V.-, 285.
Rigg, T., 741.
Riker, A. J., 538, 690, 698.
Riley, H. W., 496.
Riley, W. A., 566, 715.
Ringelmann, M., 79.
Ripley, L. B., 426.
Ripperton, J. C., 366, 385.
Ritchey, G. E., 516.
Ritchie, J., 149.
Ritchie, J. H., 238.
Ritchie, T. F., 131.
Ritchie, W. S., 445, 474, 480, 646.
Ritzman, E. G., 516, 587.
Rivera, V., 538.
Rivers, T. M., 743.
Rives, L., 45.
Rivière, G., 256.
Roach, W., 603.
Roadhouse, C. L., 733.
Roark, R. C., 150, 705.
Robbins, P. W., 398, 686.
Robbins, R. C., 358.
Robbins, W. R., 524.
Robbins, W. W., 247.
Robert, J. C., 29, 35, 94.
Robert, L. P., 420.
Robert, P., jr., 420.
Roberts, F. H. S., 154, 441.
Roberts, J. W., 275, 700.
Roberts, N. M., 492, 781.
Roberts, O. C., 385, 427.
Roberts, R. C., 213.
Roberts, R. H., 674, 751.
Roberts, R. S., 72.
Robertson, D. W., 128, 375.
Robertson, E. C., 778.
Robertson, H., 640.
Robey, O. E., 34, 463.
Robins, R., 351.
Robins, R., (Mrs.), 351.
Robinson, B. B., 33.
Robinson, B .L., 158.
Robinson, C. S., 620.
Robinson, G. T., 471.
Robinson, J. L., 377.
Robinson, R. H., 681.
Robison, W. L., 58, 591.
Robotka, F., 470.
Robyns, W., 125.
Rocha, A, 120.
Roche, B. H., 723.
Rockie, W. A., 366.
Roddy, W., 437.
Rodenhiser, H. A., 542.
Roderick, L. M., 316, 789.
Rodrigues, A. G., 582.
Rodriguez, Sardiña, J., 410.
Roeser, J., jr., 686.
Rogers, H. W., 30, 58, 590.
Rogers, W. B., 222.
Rogoff, J., 633.

Rohrman, F. A., 735.
Rolfs, A. R., 283, 425.
Rolfs, C., 137.
Rolfs, P. H., 137.
Romanoff, A. I., 63.
Roney, J. N., 705.
Roscoe, M. H., 343, 632.
Rose, D. C., 335.
Rose, F., 97, 192
Rose, M. S., 483, 769.
Rose, W. C., 339, 769.
Rosell, J. M., 313.
Rosen, C. G. A., 326.
Rosen, H. R., 294.
Rosenberg, H. A., 633.
Rosenthal, S. M., 197.
Ross, H., 437.
Ross, H. E., 73.
Ross, I. C., 74, 165, 456, 601, 744.
Ross, J. R., 483, 778.
Ross, W. H. 205.
Rost, C. O., 215.
Roth, W. J., 469.
Rothwell, C. S., 61.
Rotonda, C. la, 372.
Routt, M. V., 628.
Rowe, W. H., 469.
Roy, W. R., 489.
Rudolfs, W., 751.
Rudorf, W., 693.
Ruehe, H. A., 307.
Ruehle, G. D., 535, 699.
Ruggles, A. G., 567.
Ruhkopf, H., 101.
Rumbold, C. T., 704.
Rumreich, A., 438, 577.
Runnels, H. A., 29, 43.
Runner, G. A., 425.
Rupel, I. W., 723, 731.
Ruprecht, R. W., 505, 523.
Russell, E. J., 108.
Russell, O. E., 366.
Russell, P. F., 201, 715.
Russell, W. C., 62, 631.
Ruth, W. A., 133.
Ruttle, M. L., 224.
Ruttledge, W., 429.
Ruttle-Nebel M., 495.
Ruzek, C. V., 655.
Rydbom, M., 630.
Rygh, A., 648.
Rygh, O., 648.
Ryker, T. C., 238.

Saavedra, E. F., 279.
Sabry, I., 488.
Sachoff, T., 135.
Sachtleben, H., 419.
Sadler, H. W., 737.
Safro, V. I., 424.
Sagen, H. E., 588.
Sahyun, M., 198, 207.
Saint, S. J., 352.
St. George, R. A., 717.
St. John, J. L., 8, 621.
Sako, T., 483.
Salaman, R. N., 81.
Sallee, G. A., 757, 758.
Salmon, S. C., 240, 669.
Salt, G., 156.
Salt, R. W., 559.
Salter, R. M., 29, 468.
Samoiloff, I. I., 223.
Samoilov, I. I., 223.
Sampson, A. W., 661.
Sampson, R. W., 697.
Samuel, E. L., 486.
Samuel, G., 151, 430, 551.
Samuels, L. T., 11, 366.
Sanborn, C. E., 453.
Sanborn, R., 446.
Sanders, D. A., 596.
Sanders, P. D., 713.
Sanderson, E. D., 149.
Sanderson, W. E., 716.
Sandstedt, R. M., 204.
Sandsten, E. P., 639.
Sansone, F., 265.
Santos, F. O., 337.
Sappington, G. R., 95.
Sardiña, J. R., 410.
Sarle, C. F., 766.
Sarvis, J. T., 124, 518.
Sasaki, M., 451.
Sastri, B. N., 48.
Sater, L., 493.
Sater, L. E., 637.
Sato, K., 682.
Sattar, A., 403.
Saunders, P. T., 450.
Savastano, G., 277.
Saville, R. J., 332.
Savur, S. R., 210.
Sawyer, L. E., 534.
Saxena, B. P., 239.
Sayer, W., 549.
Sayre, C. B., 131.
Sayre, J. D., 29, 504, 692.
Saywell, L. G., 478.
Sazama, R. F., 50, 54.
Scaëtta, H., 107.
Scanlan, J. T., 654.
Schacht, H. R., 606.
Schaffner, J. V., jr., 53.
Schaffnit, E., 689.
Schaible, P. J., 804.
Schalk, A. F., 455.
Schall, B. M., 361.
Schander, 400.
Schanderl, H., 249.
Schantz-Hansen, T., 686.
Schedl, K., 284.
Scheffer, T. C., 280.
Schelesnow, P. A., 22.
Schermerhorn, L. G., 524.
Scheuber, J. R., 70.
Scheunert, A., 629.
Schiff, L., 629.
Schilder, F. A., 419.
Schilletter, J. C., 136, 394.
Schilling, E., 177.
Schimitschek, E., 285.
Schlingman, A. S., 746.
Schlots, F. E., 652, 658.
Schmidt, C. L. A., 196, 197, 356, 357.
Schmidt, E. H., 672.
Schmidt, H., 168, 740.
Schmidt, O., 694.
Schmidt, R., 684.
Schmutz, F. C., 80.
Schnauer, W., 426.
Schneider, B. H., 589.
Schneider, E. C., 769.
Schneiderhan, F. J., 188, 540.
Schnellbach, O., 610.
Schnetzler, E. E., 303.
Schoene, W. J., 51, 283.
Schoenlein, H. W., 373.
Schoenmann, L. R., 614.
Schofield, F. W., 596.
Schollander, E. G., 607.
Schollenberger, C. J., 16.
Schott, R. G., 120.
Schrader, A. L., 259, 390, 683.
Schread, J. C., 583.
Schulerud, A., 366.
Schultz, F., 101.
Schultz, H., 757.
Schultz, J. A., 445.
Schultzer, P., 636.
Schulz, G., 691.
Schulz, J. A., 473.
Schütt, 604.
Schütze, K. T., 715.
Schwantes, A. J., 78.
Schwardt, H. H., 579.
Schwartz, B. C., 473.
Schwarz, H., 176.
Schwarz, R., 234.
Schweers, M. F., 612.
Schwentker, F. F., 743.
Scoates, D., 350, 667, 750.
Scott, G. W., 247, 248.
Scott, H. T., 776.
Scott, J. P., 315, 740.
Scott, L. B., 397.
Scott, W., 743.
Scullens, H. S., 501.
Scurti, F., 414.
Searls, E. M., 53, 706.
Secrest, E., 41.
Segler, 175.
Séguy, E., 422.
Seidmon, E., 483.
Seifried, O., 317.
Sein, F., jr., 142.
Seitz, C. E., 496.
Sell, I. I., 768.
Sellick, N. P., 108.
Semeonoff, E., 296.
Semple, A. T., 59.
Sen, J., 372.
Sen, S. K., 450, 708, 745.
Senior, B. J., 299.
Serdifikov, B. V., 884.
Serdyukov, B. V., 884.
Server, G., 770.

Sethi, R. L., 289.
Setter, L. R., 751.
Severson, A., 722.
Sewell, M. C., 218, 219.
Shadduck, M., 493.
Shaffer, P. A., 198.
Shamel, A. D., 134, 260, 665, 680.
Shannon, R. C., 55.
Shapovalov, M., 274.
Sharples, A., 400.
Sharpless, G. R., 452.
Shaw, C. F., 212, 657.
Shaw, D. A., 249.
Shaw, F. R., 654.
Shaw, J. K., 249, 250, 385.
Shaw, L., 690.
Shaw, N., 210.
Shaw, R. M., 316.
Shchegolev, V. N., 706.
Shealy, A. L., 588, 593.
Shear, C. L., 402.
Shear, M. J., 88.
Shearer, P. S., 444.
Sheehy, E. J., 299, 729.
Sheets, E. W., 59.
Sheffield, F. M. L., 537.
Shell, K., 729.
Shelford, V. E., 481.
Shelmire, B., 282, 722.
Shepard, H. H., 50, 578.
Sherbakoff, C. D., 547, 551.
Sherman, F., III, 434.
Sherman, H. C., 768.
Sherman, J. E., 629.
Sherman, L. K., 606.
Sherman, L. W., 30.
Sherman, R. W., 63.
Sherwood, F. W., 778.
Sherwood, H., 393, 394.
Sherwood, R. C., 473.
Sherwood, R. M., 723.
Shinn, E. H., 336.
Shipley, F. W., 324.
Shippy, W. B., 536.
Shirky, S. B., 494.
Shirley, H. L., 262, 687.
Shoemaker, J. S., 36, 258.
Short, J. J., 92.
Shotwell, R. L., 151, 567.
Show, S. B., 11, 534.
Shreve, C., 464.
Shrewsbury, C. L., 295, 631, 646.
Shropshire, L. H., 560.
Shu, S., 317.
Shuhart, D. V., 261, 685.
Shukers, C. F., 475, 624.
Shultz, E. N., 303.
Shultz, H., 493.
Siegler, E. H., 425.
Sieglinger, J. B., 670.
Sierp, H., 20.
Sievers, F. J., 12, 494.
Silver, E. A., 75, 328, 496.
Simeón de Pedro, D., 41.
Simon, E. C., 233.
Simon, L. R., 640.
Simon, R. H., 203.
Simonnet, H., 200.
Simpson, G. W., 710.
Simpson, K. S., 746.
Simpson, M. E., 283.
Sims, I. H., 687.
Sinclair, R. G., 774.
Singh, G., 46.
Singh, K., 151.
Singh, U. B., 42.
Sinnott, E. W., 20.
Sipple, O. H., 130.
Sirks, M. J., 665.
Sjollema, B., 105.
Skalinska, M., 513.
Skalov, Г. Г. (G. G.), 715, 717.
Skelley, W. C., 591.
Skidmore, L. V., 749.
Skinner, E. R., 584.
Skinner, G., 234.
Skinner, H. B., 423.
Skinner, J. H., 638.
Skinner, J. T., 769.
Skopintzew, B. A., 360.
Škorić, V., 400.
Skovholt, O., 339.
Slate, G. L., 682.
Slate, W. L., 637.
Slautterback, J. J., 419.
Sleesman, J. P., 50.
Slipher, J. A., 323.
Sloane, R. C., 464.
Small, J. A., 522, 640.
Smallwood, J. C., 77.
Smellie, J. M., 489.
Smit, B., 70.
Smith, A., 367.
Smith, A. H., 633, 634, 769, 772.
Smith, A. K., 233.
Smith, C. B., 469.
Smith, C. E., 56, 283.
Smith, C. O., 278, 530.
Smith, C. W., 157.
Smith, E. C., 699.
Smith, F. B., 106, 378, 652, 657, 658.
Smith, F. F., 568, 709.
Smith, G. E., 419.
Smith, G. E. P., 396.
Smith, G. P. D., 409.
Smith, H. D., 443.
Smith, H. H., 422.
Smith, H. P., 723, 750.
Smith, H. R., 167.
Smith, H. S., 432.
Smith, J. H., 488, 537.
Smith, J. M., 313, 756.
Smith, J. O., 761.
Smith, K. M., 428.
Smith, L. H., 175, 506.
Smith, L. L. W., 245.
Smith, M. A., 274.
Smith, M. E., 484, 486.
Smith, N. J. G., 403.
Smith, N. R., 112.
Smith, O., 142, 245.
Smith, O. W., 122.
Smith, R. C., 569.
Smith, R. G., 640.
Smith, R. H., 563.
Smith, R. S., 506.
Smith, R. W., 667.
Smith, T. O., 115.
Smith, W. R., 70.
Smuts, D. B., 627, 628.
Smyth, H. F., 428.
Smyth, H. F., jr., 428.
Smythe, C. V., 203.
Snapp, O. I., 50, 283, 558, 561, 705.
Snell, M. E., 367, 378, 385.
Snell, M. G., 727.
Snell, W. H., 418.
Snow, C. P., 500.
Snyder, E., 684.
Snyder, R. S., 254.
Snyder, W. C., 690.
Snyman, P. S., 70.
Sokolovitch, M., 184.
Sommer, H. H., 67, 658, 731, 735, 736.
Sorenson, C. J., 287.
Sosnovskii, D., 135.
Sosnovsky, D., 135.
Southern, B. L., 404.
Souza, M. A. de, 455, 458.
Spangler, M. G., 77.
Spaulding, P., 148.
Speicher, B. R., 570.
Spencer, D. A., 158, 723.
Spencer, G. J., 284.
Spencer, H., 283.
Spencer, H. J., 87.
Spencer, V. E., 367.
Speyer, W., 419.
Spies, J. R., 51.
Sprague, G. F., 226, 515.
Sprague, H. B., 123, 127, 378, 517.
Sprengel, L., 285.
Sprunt, A., jr., 281.
Spruyt, J. P., 779.
Spuler, A., 192, 288, 425.
Squier, R. R., 377.
Squirrell, W. J., 234.
Sreenivasaya, M., 48.
Stableforth, A. W., 599.
Stadler, L. J., 378.
Staebner, F. E., 496.
Stafseth, H. J., 75, 171, 459, 461.
Stahl, A. L., 523.
Staker, E. V., 214, 656.
Stakman, E. C., 512.
Stålfors, H., 314.
Stampa, G., 93.
Staner, P., 47.
Stauford, J. S., 425.
Stangel, 723.
Staniland, L. N., 284.
Stanley, W. W., 561, 563.

Stansel, R. H., 531, 667, 673.
Stanton, T. R., 128, 139, 670.
Stapledon, R. G., 236.
Stark, B. S., 349.
Stark, C. N., 595.
Starr, L. E., 166.
Stateler, E. S., 491.
Stauber, B. R., 80.
Stearns, G., 189.
Stearns, L. A., 423, 424.
Stebbing, M. E., 398.
Stebnitz, V. C., 731.
Steckley, J. C., 234.
Steece, H. M., 782.
Steele, D. G., 231.
Steenbock, H., 91, 159, 723, 769, 776.
Steer, H. B., 137.
Steere, W. C., 513.
Steggerda, M., 474.
Stein, H. B., 93.
Steinbrecher, H., 468.
Steiner, L. F., 54.
Steinweden, J. B., 430, 709.
Stell, F., 399.
Stellwaag, F., 284, 285.
Stenius, P. I., 604.
Stephens, J. C., 667, 673.
Stephenson, R. E., 213.
Stevens, C. L., 533.
Stevens, F. D., 516.
Stevens, N. E., 146, 402.
Stevens, O. A., 522.
Stevens, W. R., 366.
Stevenson, L., 171.
Stewart, A. D., 337.
Stewart, G., 229, 230, 237.
Stewart, M. A., 576.
Stewart, R., 367, 462.
Stewart, S., 123, 191.
Steyn, D. G., 70.
Stichter, G. B., 577.
Stickels, A. E., 232.
Stiebeling, H. K., 85.
Stiles, G. W., jr., 453.
Still, E. U., 89.
Stine, L., 776.
Stippler, H. H., 469.
Stirling, F., 559.
Stirniman, E. J., 496.
Stoa, T. E., 667.
Stokdyk, E. A., 394.
Stokes, I. E., 672.
Stokes, W. E., 516, 523.
Stokvis, J. A., 482.
Stone, J. C., 613.
Stoneberg, H., 233.
Storie, R. E., 506.
Stoughton, R. H., 537.
Stout, A. B., 247, 514.
Stout, G. L., 410, 694.
Stout, O. V. P., 496.
Stout, W. B., 80.
Stoutmyer, V. T., 385.
Stracener, C. L., 283, 640.
Strahan, J. L., 496.
Straib, W., 691, 692.
Strand, T., 425.
Stratton, F. C., 260.
Street, O. E., 381, 383.
Streeter, L. H., 427.
Streeter, L. R., 288, 526, 527, 708.
Streets, R. B., 265.
Stringfield, G. H., 29.
Stroman, C. W., 611.
Stroman, G. N., 519.
Strommen, A. M., 669.
Strong, F. C., 46.
Strong, M. C., 46, 143.
Strong, W. J., 675.
Stroud, J. F., 505.
Stuart, G., 451.
Stuart, H. O., 592.
Stuart, N. W., 679.
Stuart, R. Y., 534, 614.
Stull, A., 199.
Sturgis, M. B., 222, 640.
Sturlaugson, V., 667, 722.
Suchier, A., 7.
Summerfeldt, P., 484.
Summerville, W. A. T., 288.
Sumner, C. B., 690.
Sunderlin, G., 341, 345.
Supplee, G. C., 187, 489, 490.
Sure, B., 484, 486.
Sutton, J. G., 607.
Svirbely, J. L., 649.
Swanback, T. R., 381, 383.
Swanson, P., 385, 473.
Swanson, W. W., 475.
Swarbrick, T., 132, 135.
Swartwout, H. G., 386, 424.
Sweeney, M. A., 316.
Sweeney, M. P., 250.
Sweeney, O. R., 329.
Sweeny, M. E., 184.
Sweetman, H. L., 577, 719.
Swier, G. B., 495.
Swift, M. E., 702.
Swift, R. W., 62.
Swingle, W. T., 260.
Switzer, H. B., 313.
Szebellédy, L., 361.
Szeberényi, P., 362.
Szent-Györgyi, A., 645, 649.
Szymoniak, B., 130, 191, 394.

Tadokoro, T., 26.
Taft, L. R., 463.
Taggart, W. G., 233.
Tai, E. S., 489.
Takagi, G., 157.
Takahashi, I., 396.
Takahashi, M., 385.
Takahashi, R., 482, 710, 711.
Takato, R., 435.
Talarewitch, E., 74, 743.
Talbert, T. J., 251, 378, 386.
Talbot, P. R., 316.
Tanaka, T., 395.
Tandon, R. N., 45.
Tanner, F. W., 769.
Tanner, V. M., 429.
Tapke, V. F., 692.
Tapley, W. T., 525, 674.
Tarip, 171.
Tascher, W. R., 378.
Tasugi, H., 403.
Tate, H. D., 432.
Taubenhaus, J. J., 406, 545, 546, 555, 690, 694.
Tayloe, W. L., 378, 386.
Taylor, C. C., 757.
Taylor, F. W., 517.
Taylor, G., 655.
Taylor, N. H., 741.
Tedin, O., 24.
Tegetmeier, W. B., 422.
te Hennepe, 604.
Tehon, L. R., 410.
Templeton, H. L., 731, 736, 769.
Tepper, A. E., 592, 596.
Terechov, A. F., 384.
Terekhov, A. F., 384.
Termohlen, W. D., 180, 765.
Terrill, E. D., 770, 771.
Tessenow, M., 20.
Teterevnikova-Babajan, D. N., 691.
Teubner, E., 284.
Tewfik Fahmy, 407.
Thalman, R. R., 725.
Thatcher, H. S., 349.
Thatcher, L. E., 29, 58, 75, 240, 521.
Thatcher, R. W., 192.
Thayer, J. W., jr., 31.
Theiler, H., 319.
Theis, E. R., 357.
Thiel, A. F., 131.
Thiem, H., 285.
Thies, W. H., 427.
Thiessen, E. J., 85.
Thomas, A. D., 70.
Thomas, B. H., 444, 445, 725.
Thomas, C. A., 50, 565.
Thomas, E. F., 596.
Thomas, F. L., 705.
Thomas, H. E. (N. Y.), 552.
Thomas, H. E. (Calif.), 554.
Thomas, H. L., 119, 470, 760, 761.
Thomas, J. E., 287.
Thomas, N. J., 234.
Thomas, R. C., 43.
Thomas, W., 659, 677.
Thomas, W. A., 50.
Thomas, W. P., 762, 763.
Thompson, A. P., 303.

Thompson, E. J., 781.
Thompson, F. M., jr., 579.
Thompson, H. M., 166.
Thompson, L. G., jr., 658.
Thompson, O. A., 667.
Thompson, R. B., 303.
Thompson, R. G., 261.
Thompson, S. H., 470.
Thompson, W. C., 593, 612.
Thompson, W. L., 559, 560.
Thompson, W. M., 166.
Thompson, W. P., 229, 518.
Thompson, W. R., 287.
Thompson, W. W., 459, 461, 746.
Thomsen, F. L., 334, 619.
Thomsen, O., 747.
Thomson, E. H., 469, 614.
Thomson, H. M. S., 487.
Thomson, J. R., 50, 558, 705.
Thomson, R. B., 181.
Thornberry, H. H., 275.
Thorne, C. E., 494.
Thornton, B. J., 522.
Thornton, S. F., 106, 651.
Thorold, C. A., 430.
Thorp, F., jr., 71, 312, 745, 747.
Thorp, J., 638.
Thorpe, W. H., 290, 443.
Thorvaldson, T., 753.
Thrash, C. L., 468.
Thysell, J. C., 518.
Tichonow, P. M., 116.
Tikhonov, P. M., 116.
Tilford, P. E., 43, 556.
Tillyard, R. J., 576.
Timofeeff-Ressovsky, N. W., 232.
Tims, E. C., 233, 263.
Tincker, M. A. H., 386.
Tindale, G. B., 391.
Tine, J. E., 110.
Tingey, D. C., 663.
Tinkler, C. K., 183.
Tisdale, L. E., 540.
Tisdale, W. B., 550.
Tisdale, W. H., 541.
Tisdall, F. F., 490.
Tissot, A. N., 559.
Tissue, K. A., 358.
Tittsler, R. P., 452, 459.
Titus, H. W., 729.
Todd, F. E., 156, 720, 721.
Todd, W. R., 348.
Toenjes, W., 39.
Togashi, K., 145, 269.
Toit, P. J., du, 70.
Tolle, C. D., 481.
Tolley, H. R., 469, 614, 757.
Tomkins, R. G., 698.
Tompkins, C. M., 549.
Tonzig, S., 661.
Tooke, F. G. C., 293.
Toole, E. H., 522.
Topley, B., 356.
Topley, W. W. C., 738.
Topper, A., 476, 487.
Torgerson, E. F., 109.
Toryu, Y., 451.
Totman, C. C., 181.
Toumey, J. M., 351.
Towle, R. S., 379.
Townsend, G. R., 44.
Toyoshima, T., 451.
Tracy, P. H., 66, 307.
Trägardh, I., 285.
Trappmann, W., 419.
Traub, H. P., 531.
Travis, B. V., 577.
Treloar, A. E., 473.
Triebold, H. O., 359.
Triffitt, M. J., 270.
Troell, E., 7.
Trought, T., 238.
Trout, G. M., 66.
Trout, S. A., 509.
Trowbridge, E. A., 445, 586.
Trowbridge, P. F., 782.
Truesdail, R. W., 481.
Trullinger, R. W., 496.
Truog, E., 657, 669.
Trussell, D. F., 506.
Tsai, L. S., 188.
Tschesche, R., 101, 102.
Tshesnokov, P. G., 706.
Tsygankov, S. K., 716.
Tu, C., 542.
Tubangui, M. A., 169, 282.
Tubeuf, C. von, 48, 371, 557.
Tucker, C. M., 535.
Tucker, H. H., 449.
Tucker, L. R., 683.
Tucker, R. W. E., 154, 352.
Tukey, H. B., 249, 256.
Tumanow, I. I., 508.
Tunnicliff, E. A., 817, 456.
Turbangui, M. A., 743.
Turneaure, F. E., 753, 754.
Turner, C. W., 304, 377, 447.
Turner, D., 769.
Turner, M. E., 207.
Turner, N., 565, 717.
Turner, R. G., 491, 777.
Turner, W. A., 731, 732.
Turner, W. H., 273.
Tuteff, I., 44.
Tuthill, E., 7.
Tutin, F., 284.
Tuttle, A. P., 220.
Twinn, C. R., 428.
Tysdal, H. M., 379.
Tyzzer, E. E., 319, 457.
Tsuigankov, S. K., 716.

Udall, D. H., 312, 313.
Uhlenhuth, P., 738.
Ulchanco, L. B., 155, 429.
Underhill, F. A., 488.
Underhill, F. P., 769.
Upp, C. W., 288, 313.
Upshall, W. H., 256.
Urban, F., 99.
Urner, J. A., 485.

Vaccaro, H., 748.
Vahlteich, E. McC., 483.
Vaiden, M. G., 761.
Valleau, W. D., 550.
van Alstyne, L. M., 681.
van Beyma Thoe Kingma, F. H., 695.
van Beynum, J., 163.
Vance, A. M., 57, 582.
Vandecaveye, S. C., 221, 237.
van den Brink, R. C. B., 246.
van den Honert, T. H., 659.
van der Goot, P., 435.
van der Hoeden, J., 160, 741.
van der Merwe, C. P., 426.
van der Merwe, C. R., 242, 243.
Van Donk, E., 91.
Van Donk, E. C., 769.
van Dyke, H. B., 297.
van Emden, F., 443.
Van Es, L., 310.
Van Escltine, G. P., 525.
Vango, H. M., 316.
van Heelsbergen, T., 318.
Van Meter, R. A., 385.
Van Rensselaer, M., 97, 98, 192, 640.
Van Riper, W., 119.
Van Roekel, H., 457.
Van S., G., 122.
Vansell, G. H., 720, 721.
Vanselow, A. P., 14.
Van Stolk, 200
Vanterpool, T. C., 139.
Van Volkenberg, H. L., 597.
van Wijk, A., 103.
Vareton, E., 20.
Vargas, J. B., 435.
Vasil'chenko, I. T., 384.
Vasinger-Alektorova, A. V., 384.
Vasilchenko, I. T., 384.
Vaughan, H. W., 58.
Vaughan, J. M., 486.
Vaughan, L. M., 179.
Vazinger-Alektorova, A. V., 384.
Veatch, J. O., 37, 494.
Veihmeyer, F. J., 322, 683.
Venables, E. P., 284.
Venstrom, C., 471.
Verner, L., 257, 392.
Vestal, C. M., 295.
Vestal, E., 548.
Vestal, E. F., 890.
Viala, P., 45.

Vickery, H. B., 9, 356, 621, 769.
Vickery, J. R., 587.
Vietinghoff-Riesch, A. von. 285.
Vigfusson, V. A., 753.
Vincent, E. L., 625.
Vinke, L., 300.
Vinson, C. G., 386, 409, 697.
Vivian, A., 351.
Voegtlin, C., 197.
Voelcker, J. A., 123.
Vogel, M. A., 50, 425.
Voi, D. H., La, 446.
Volk, A., 689, 690.
Volk, N. J., 657.
Vollmer, O., 284.
Volz, E. C., 385, 685.
Voorhies, E. C., 616.
Voorneveld, M. V. E., 477.
Voris, L., 62.
Voss, A., 20.

Wachter, H. M., 29.
Wade, G., 326.
Wadsworth, H. A., 366.
Wagener, K., 167, 454.
Wager, P. W., 181.
Wagner, F., 387.
Wait, B., 477.
Waite, C. A., 349.
Wakefield, R. P., 335.
Wakeland, C., 290, 294.
Wakeman, S. A., 16, 109.
Waldo, G. F., 135, 395.
Waldron, L. R., 667.
Walker, A. L., 761.
Walker, E. L., 316.
Walker, F. W., 559.
Walker, G. P., 656.
Walker, H. G., 150.
Walker, J., 73, 74, 451.
Walker, J. C., 690.
Walker, M. N., 535.
Walker, R. H., 114.
Wall, N. J., 470, 471, 614.
Wallace, D. B. J., 236.
Wallace, G. B., 417, 702.
Wallace, H. A., 757.
Wallace, T., 133.
Wallen, C. J., 69.
Waller, A. G., 81, 82, 613, 615.
Walster, H. L., 656.
Walton, C. L., 284.
Walton, J. H., 6, 216.
Walton, W. R., 151.
Wan, S., 481.
Wang, D., 15.
Warburton, C. W., 614.
Ward, C. B., 310, 750.
Ward, F. S., 416.
Ward, J. C., 281.
Ward, R. W., 680.
Wardlaw, C. W., 415, 416.
Ware, J. O., 24, 25, 647, 669.
Wariar, U. A., 26.
Waring, E. B., 780.
Warner, J. D., 516.
Warrack, G. H., 171.
Warren A. J., 583.
Warren, G. F., 469.
Warren, G. M., 350.
Warweg, E., 249.
Warwick, B. L., 665, 667, 723, 727.
Washburn, R. G., 65.
Wason, E. J., 714.
Wassermann, A. Von, 789.
Waterhouse, W. L., 405.
Waters, H., 294.
Waters, N. F., 444.
Watkins, A. E., 673.
Watkins, J. V., 685.
Watson, E. A., 313, 450.
Watson, J. C., 614.
Watson, J. R., 559.
Watzl, O., 284.
Waugh, W. A., 649, 650.
Weaver, C. H., 450.
Weaver, J. E., 235.
Weaver, L. A., 445.
Weaver, L. E., 320.
Weaver, W. E., 30, 65, 380.
Webb, B. H., 161.
Webb, E. J., 472.
Webber, H. A., 329.
Webber, H. J., 531, 532.
Weber, A. L., 631.
Weber, G. F., 141, 535, 651.
Weber, H., 432.
Webster, J. E., 674.
Webster, R. L., 283, 425, 441, 578.
Webster, T. A., 201.
Wedgworth, H. H., 536.
Wedmore, E. B., 721.
Weetman, L. M., 399.
Wegener, K., 211.
Wehrwein, C. F., 757.
Wehrwein, G. S., 179, 183, 614, 759.
Weidemann, A. G., 33.
Weidlich, G., 201.
Weigel, C. A., 709.
Weinberger, J. H., 528.
Weisberg, S. M., 477.
Weisner, E. S., 64.
Weiss, F., 556.
Weiss, H. B., 81, 433.
Weiss, R., 99.
Welborne, W. W., 29, 35, 94.
Welch, H., 749.
Weld, L. D. H., 334.
Wellington, R., 677.
Wellmann, F. L., 690.
Wellmann, O., 599.
Wells, H. G., 769.
Welton, F. A., 29, 660.
Weniger, W., 690.
Wenner, G. F., 84.
Went, F. W., 661.
Wentz, J. B., 377.
Werkman, C. H., 356, 661.
Werner, G., 463.
Werner, H. O., 520.
Werner, O. S., 24.
Werner, W. H. R., 711.
Werth, A. J., 180.
Wertz, V. R., 80, 331, 470.
Wesp, E. F., 208.
Wessels, P. H., 15.
Wesson, L. G., 774.
West, A. P., 359.
West, C. J., 645.
West, E. S., 202.
West, J., 546.
West, R., 199.
Westbrook, S. J., 614.
Wester, R. E., 141.
Westgate, J. M., 385, 494.
Westgate, W. A., 429, 560.
Westover, H. L., 518, 669.
Wexelsen, H., 25.
Wharton, W. R. M., 423.
Wheeler, G. A., 488.
Wheeler, K. M., 210, 654.
Wheeler, P. R., 688.
Wheeler, S. S., 59.
Wheeler, T. S., 195.
Wheeler, W. M., 289.
Whetzel, H. H., 547.
Whipple, W., 322.
Whitacre, J., 770, 771.
Whitaker, E. B., 610.
Whitcomb, W., jr., 283.
Whitcomb, W. D., 424, 427.
Whitcomb, W. O., 522.
White, A. H., 162, 163.
White, G. C., 733.
White, G. E., 446.
White, H. B., 496.
White, H. E., 385, 548.
White, J. W., 17, 658.
White, R. P., 397.
White, T. H., 261.
Whitehead, T., 409.
Whiteman, T. M., 42, 396.
Whittemore, J. W., 752.
Wiancko, A. T., 16, 656.
Wichers, H. E., 350.
Wickens, D. L., 181, 470, 615.
Wickens, G. W., 414.
Wiesehuegel, E. G., 41, 137.
Wiggin, W. W., 36.
Wigglesworth, V. B., 423.
Wight, A. E., 455.
Wijk, A. van, 103.
Wilbrink, G., 272.
Wilbur, J. B., 784.
Wilcke, H. L., 444, 450.
Wilcox, J., 425, 712.
Wilcox, W. W., 470.
Wild, N., 696.
Wilder, O. H. M., 88.
Wilder, W., 58, 65, 88.
Wildman, A. B., 727.
Wildman, J. D., 298.

Wildon, C. E., 533.
Wileman, R. H., 496.
Wiley, J. R., 764.
Wilke, S., 426.
Wilkins, F. S., 128, 378.
Wilkinson, H., 430.
Willard, C. J., 29, 30, 32, 125, 240.
Willard, H. S., 65.
Wille, F., 401.
Willey, H. F., 385.
Willham, O. S., 301.
Williams, C. B., 656.
Williams, C. F., 529.
Williams, C. G., 94.
Williams, H. R., 125.
Williams, L. L., 439, 571.
Williams, R. C., 540.
Williams, R. M., 379.
Williams, R. W., 421.
Willis, E. A., 608.
Willis, R. L., 36.
Willman, J. P., 745.
Willson, E. A., 767.
Wilmot, R. J., 711.
Wilsie, C. P., 620.
Wilson, A. L., 676.
Wilson, B. D., 214, 656.
Wilson, D. C., 89.
Wilson, D. R., 598, 744.
Wilson, D. W., 769.
Wilson, E. E., 552, 554.
Wilson, E. H., 437.
Wilson, G. S., 738.
Wilson, H. F., 653, 706, 721.
Wilson, H. K., 351.
Wilson, J. D., 43, 551, 689.
Wilson, J. F., 282.
Wilson, J. J., 399.
Wilson, J. W., 94, 427, 559.
Wilson, L. T., 731.
Wilson, M. J. F., 48.
Wilson, M. L., 496, 614.
Wilson, P. W., 657.
Wilson, T. O., 239.
Wilson, T. R. C., 174.
Wilson, W. M., 77.
Wilster, G. H., 736.
Windaus, A., 101, 201.
Windus, W., 339.
Wingard, S. A., 410.
Winkler, A. J., 581.
Winkler, C. A., 357.
Winston, G. T., 784.
Winston, J. R., 532.
Winter, H. F., 43.
Winter, O. B., 620.
Winters, L. M., 231.
Winters, R. K., 688.
Winton, A. L., 472.
Winton, K. B., 472.
Wirth, D., 310.
Wiseman, H. G., 732.
Wishart, J., 672.
Wisnicky, W., 454.
Wister, J. C., 397.
Witt, D. B., 476.
Wolcott, G. N., 573.
Wolfe, H. S., 136.
Wolfe, J. M., 120.
Wolfenbarger, D. O., 700.
Wolff, L. K., 501.
Wolff, S. E., 556, 690.
Wolochow, D., 753.
Womack, E. B., 122.
Wood, G., 770.
Wood, J. F., 667, 673.
Wood, J. G., 116, 117.
Wood, P. D., 574.
Wood, T. B., 724.
Woodard, O., 381, 387.
Woodbridge, M. E., 130, 522.
Woodman, H. E., 724.
Woodrow, A. W., 581.
Woodrow, J. W., 725.
Woods, A. F., 783.
Woodson, J. C., 191.
Woodward, K. W., 533.
Woodward, T. E., 65.
Woodworth, H. C., 613.
Wooley, J. C., 462.
Woolf, B., 646.
Working, H., 182.
Workman, W. G., 438, 577.
Worthley, H. N., 433, 561, 713.
Worthley, L. H., 713.
Wrentmore, G. W., 447.
Wriede, 175.
Wright, A. H., 669.
Wright, J., 45.
Wright, J. G., 456.
Wright, K. E., 447.
Wright, K. T., 64, 84, 446.
Wright, P. F., 705.
Wright, R. C., 42.
Wright, S. J., 75.
Wright, W. H., 538.
Wroblewski, W., 312.
Wu, P. K., 711.
Wu, Y. F., 715.
Wu Liang-yu, 716.
Wüst, J., 356.
Wyche, R. H., 657, 667, 673.
Wyman, L., 535.

Yamagiwa, S., 451.
Yamaguchi, T., 286.
Yang, C. S., 480.
Yarnell, S. H., 673, 682.
Yasuda, M., 206.
Yeager, A. F., 667, 673.
Yerkes, G. E., 397.
Yetter, W. P., jr., 54.
Yoder, L., 473.
Yothers, M. A., 49, 152, 425.
Youden, W. J., 15.
Young, A., 445.
Young, A. W., 114.
Young, E. G., 65.
Young, G. E., 758.
Young, H. C., 43, 412, 540.
Young, H. N., 616.
Young, R. E., 386.
Young, T. B., 96.
Young, V. H., 547.
Young, W. Y., 358.
Youngberg, S., 450.
Youngblood, B., 612.
Yugawa, H., 433.

Zach, F., 539.
Zacher, F., 426.
Zattler, F., 108.
Zaumeyer, W. J., 544, 545.
Zawadowsky, M. M., 377.
Zeigler, L. W., 559.
Zeller, S. M., 276.
Zetterberg, J. M., 215.
Zheleznov, P. A., 22.
Zilva, S. S., 344.
Zimmerley, H. H., 37, 192, 671.
Zimmerman, C. C., 767.
Zimmerman, P. W., 40, 245, 380.
Zimmermann, F., 43.
Zirm, K. L., 104.
Zon, R., 614.
Zook, D. E., 771.
Zotta, G., 444.
Zoutendyk, A., 452.
Zuill, F., 386.
Zundel, G. L. I., 702.
Zwölfer, W., 285.

INDEX OF SUBJECTS

NOTE.—The abbreviations "Ala.," "Conn.State," "Mass.," etc., after entries refer to the publications of the respective State experiment stations; "Alaska," "Hawaii," "P.R.," and "V.I." to those of the experiment stations in Alaska, Hawaii, Puerto Rico, and Virgin Islands; "Can." to those of the experiment stations in Canada; and "U.S.D.A." to those of this Department.

Abaca, relation to banana wilt fungus, 405.
Abella new species, description, 443.
Abortion—*see also Bacillus abortus, Bacterium abortus, Brucella abortus,* and *Alcaligines abortus.*
- agglutination test, factors affecting, 596.
- diagnosis by rapid agglutination test, time element in, 741.
- eradication from station dairy herd, Md. 742.
- in cattle, control, 72, 312, 449, 450; Tex. 740; Wyo. 70.
- in cattle, effect of metaphen on agglutinin titer, 72.
- in cattle, effect of organic iodine feeding, N.J. 594.
- in cattle, relation to nutrition, Wis. 313.
- in cattle, relation to undulant fever in man. 741.
- in range animals, 314.
- in South Africa, *Vibrio foetus* as cause, 70.
- relation to milk, 313.
- tests, N.H., 596.
- tube and rapid agglutination tests for, Ohio 69.

Acacia mollissima, seed selection in, 137.
Acanthaleyrodes, new genus, erection, 432.
Acanthosyurus shortridgei n.sp., notes, 70.
Accessory food factors, *see* Vitamins.
Accounting, farm, *see* Farm accounting.
Acetaldehyde, effect on plant respiration, 509.
Acetic acid as soil disinfectant, 540; Mass. 399.
Achlya prolifera affecting rice, 267.
Achromobacter putrefaciens, proposed name, Iowa, 808.
Acid ingestion, long-continued, effect on reproduction, 295.
Acid phosphate, *see* Superphosphates.
Acidimetry—
- applied, principles, treatise, 208.
- combination indicator for, 108.

Acidosis in dairy cattle, Ohio 65.
Acids—
- amino, *see* Amino acids.
- fatty, *see* Fatty acids.
- organic, production from carbohydrates, U.S.D.A. 359.

Acorns, feeding value, 589.
Acrobasis spp. notes, Fla. 559.
Acrobasis vaccinii, notes, Fla. 559.
Acrocercops astaurota, biology and control, 579.
Acronarista cornuta n.sp., description, Tex. 576.
Acrostalagmus aphidium, notes, 694.
Acrothecium n.sp., on grapevines in India, 46.
Actinobacillosis—
- and actinomycosis, differentiation, 740.
- in sheep, 70.

Actinomyces scabies, notes, 407.
Actinomycosis and actinobacillosis, differentiation, 740.
Acuaria hamulosa in Ontario poultry, 596.
Addisin, proposed name for hormone of human gastric juice, 629.
Adelges pinicorticis, notes, 566.
Adelphocoris superbus, notes, Utah 287.
Adobe houses, temperature lags in, Calif. 605.
Adrenal cortex, chemistry, 645.
Aedes aegypti, see Yellow fever mosquito.
Aegeria exitiosa, see Peach borer.
Aegeria rutilans, see Strawberry crown moth.
Aegilops and Triticum crosses, cytological studies, 119.
Aerobacter aerogenes and *Escherichia coli,* differentiation, 662.
African coast fever—
- immunity in, 70.
- studies, 314.
- transmission experiments, 451.

Agalaxy, contagious, causative agent, 312.
Agamermis sako, life history and habits, 719.
Agave leaf diseases, notes, 408.
Agave lechuguilla fiber and waste, composition, 619.

Agricultural—
adjustments, papers on, U.S.D.A. 614.
chemistry, *see* Chemistry.
colleges—*see also* Iowa, Kansas, Massachusetts, *etc.*
organization list, U.S.D.A. 85.
credit—
and economic organization, 471.
corporations and problems, 469.
movement, directed, results, U.S.D.A. 614.
research in, 470.
depression and farm relief in England, 471.
education—*see also* Agricultural colleges *and* Agricultural schools.
among negroes, status, U.S.D.A. 336.
in warm countries, institutions for, 767.
engineering, *see* Engineering.
experiment stations, *see* Experiment stations.
extension, *see* Extension.
finance in *South* Carolina, S.C. 615.
journals, new, 352.
labor tables, Wis. 757.
legislation, international yearbook, 472.
machinery—*see also* Combines, Threshing, *etc.*
experiments, *Can.* 407.
for injecting carbon disulfide beneath soil surface, 329.
institute for, activities, 175.
technic, handbook, 468.
outlook—
for next ten years in America, 469.
for 1932, U.S.D.A. 181.
for Southern States, U.S.D.A. 84.
work, history and objectives, 469.
production, adjustments in, 469.
products—
grading, application of color measurement in, U.S.D.A. 335.
import regulations on, handbook, 335.
marketing, *see* Marketing.
price index 1880 to 1931, Ohio 331.
prices, index numbers, Ohio 331, 470.
research—
adjustments in, 322.
at field station, Sacaton, Ariz., U.S.D.A. 94.
federal appropriations, editorial, 643.
schools, evening, on marketing—
of vegetables, organization, 768.
of wool and mohair, organization, 768.
Agriculture—
American, economic policy for, conference, 757.
Department of, *see* United States Department of Agriculture.
Agriculture—Continued.
electricity in, *see* Electricity.
of Connecticut Valley, Conn.Storrs 180.
of Holland, 332.
tropical and subtropical, use of fertilizers in, 113.
Agrilus ruficollis, notes, Mich. 438.
Agromyza phaseoli, notes, 426.
Agrostemma linicola n.sp., notes, 884.
Agrotis segetum, control, 284.
Air, composition, effect on growth and mortality of chick embryo, 63.
Air *passage* through soil, rate, 244.
Airplanes—
rôle in grasshopper control, 567.
transportation of mosquitos by, 436.
Alabama Polytechnic Institute, notes, 639.
Alaria mustelae n.sp., description, 283.
Alaska Stations, publications, list and index, 191.
Albinism in ragi, 26.
Albumin, egg—
coagulation, X-ray study, 357.
purified, change of rotatory power, 4.
used in angel-food cake, differences, 621.
Alcaligines—
abortus—see also Bacillus abortus, Bacterium abortus, Brucella abortus, and Abortion.
polyvalent antigen, serological study, 166.
tests for, 596.
bronchisepticus, relation to pleuropneumonia, 315.
melitensis, see Brucella melitensis.
Alcohol—
in blood, interferometric determination, 209.
separation of empty red spruce seed, effect, 41.
Aldose sugars, oxidation, course by bromine water, 199.
Alduronic acids, naphthoresorcinol reaction with, 104.
Aleurodes bergi, notes, 562.
Aleurodes citri, see White fly, citrus.
Aleyrodidae of India, 151.
Alfalfa—
and red clover, protein in, comparison, 82.
and tankage, supplement to hogging down corn, Mont. 300.
aphid, control by burning, equipment for, Calif. 605.
as pasture crop for dairy cows, S.Dak. 158.
breeding, Nebr. 517.
culture experiments, N.Dak. 667; Ohio 517; Wyo. 81.
cutting experiments, Calif. 516; Ohio 517.
diseases, studies, Calif. 585.
fertilizer experiments, Ia. [illegible]; N.Mex. 29; Tex. [illegible].
green, leaf meal, and meal, comparison for laying hens, N.Mex. 730.

Alfalfa—Continued.
Hansen Whiteseed, description, S.Dak. 30.
hay, artificial drying, 328.
hay, artificial drying, effect on vitamin A in, 59.
hay, curing and storage, Iowa 378.
hay, feeding value and relation to sterility, Nev. 448.
hay, phosphoric acid in, N.Dak. 667.
hay v. flax straw for cattle, S.Dak. 58.
improvement, N.J. 517.
inoculation studies, 123.
irrigation requirements, Can. 463.
Kaw, new variety, 669.
leaf meal, nutritive value for growing chicks, N.Mex. 62.
loss of stands in, N.Dak. 667.
nodulation and growth, relation to strains of nodule bacteria, 237.
pasture for fattening cattle, Nebr. 589.
pollination and seed setting, 237.
production, effect on composition of arid soil, 16.
rations, physiological effect, 723, 731.
seed production, 126; Mich. 32; Utah 126.
seed production, effect of bees, Mich. 384.
seed production, rôle of insects in, Utah 287.
seed, quality, effect of color and plumpness, 287.
seed, quality sold in Colorado, Colo. 126.
seed, relation of plumpness to viability, 522.
seed setting, 237.
seeding, cultivation, and cutting experiments, Iowa 378.
seedlings, hardiness, determination, 379; Nebr. 508.
source of seed and curing studies, Nebr. 517.
stem nematode, relation to alfalfa seed production, Utah 287.
strains resistant to homopterous insects, 53.
use of water for, effect of irrigation head and length of run, N.Mex. 76.
varieties and strains, N.J. 123.
variety tests, 31; Iowa 378; La. 28; Mass. 378; N.Dak. 667; N.Mex. 29; Nebr. 517; Ohio 517; Tex. 668; U.S.D.A. 28; W.Va. 666; Wyo. 31.
vitamin A in, effect of artificial drying, Ind. 589.
weevil, notes, Nev. 427.
weevil, physical ecology, 719.
weevil, relation to alfalfa seed production, Utah 287.
wilt, relation to soil temperature and moisture, Ill. 693.
Alkali—
disease in livestock, S.Dak. 69.
effect on protein, 195.
Alkali—Continued.
salts, effect on nitrification in Indian soils, 218.
Alkalies, effect on germicidal value of sodium hypochlorite, Mich. 5.
Alkaloids—
action on seed germination, 660.
photosynthesis in presence of, 660.
Allium cepa, irradiation of roots, dosage, 512.
Alliums, cultivated, of China and Japan, 130.
Alloys, atmospheric corrosion, 404.
Almond tingids, new enemy, 285.
Almonds, varieties in Sicily, 397.
Aloe, bacterial parasite, 703.
Alopecia in kids and lambs, cause, 70.
Alsophila pometaria, see Cankerworm, fall.
Alternaria—
erythrinae n.sp., and ascospore form, 703.
panax on ginseng, control, 547.
Althaea rosea, chromosome numbers, 225.
Aluminum—
assimilation by human system, 629.
in plants, 479.
salts, aluminum and excess acid in, determination, 361.
Alysia ridibunda, parasitic on blowfly larvae, 558.
Amaryllis, breeding, Iowa 385.
American—
Association of Medical Milk Commissions, proceedings, 165.
Bureau of Welding. Structural Steel Welding Committee, report, 78.
Dairy Science Association, proceedings, 165.
Society of Agricultural Engineers, meeting, 495.
Sociological Society, papers on rural sociology, 182.
Amino acid deficiencies of protein mixtures in foods, 627.
Amino acids—
and hydroxy-amino acids, apparent dissociation constants, 357.
basic, of silk fibroin, 9.
dissociation constants, 107.
highly purified mixtures, feeding experiments, 330.
history of discovery, 356.
in blood serum, determination, 104.
in nutrition, 769.
trivalent, peptides of, 196.
under ultra-violet light, splitting off of ammonia from, 99.
Amino nitrogen, gasometric determination, 104.
Ammonia—
in soil, effect of green manure, 17.
splitting off from amino acids, 99.
Ammonium—
sulfate, effect on soil reaction, 658.
sulfate v. sodium nitrate for apples, W.Va. 678.
thiocyanate as weed eradicant, 130.

Amphibians as host for chiggers and other ectoparasites, 49.
Amphimermis zuimushi n.g. and n.sp., description, 579.
Anaplasma marginale, notes, 311, 600, 743.
Anaplasmosis—
  in cattle, 449; Calif. 595; Fla. 596.
  in fowls, La. 313.
  in livestock, 313.
  studies, Tex. 740.
  transmission by American dog tick, 311, 597.
  transmission by various ticks, U.S.D.A. 597.
  transmission experiments by horseflies, Okla. 453.
  types of disease, 311.
Anarsia lineatella, see Peach twig borer.
Anasa tristis, see Squash bug.
Ancylis comptana, see Strawberry leaf roller.
Anemia—
  achlorhydric, cause and treatment, 92.
  and pellagra-like symptoms in rats, lack of correlation, 92.
  due to milk diet, value of amino acids, 92.
  etiology and treatment, 486.
  hemorrhagic, changes in erythrocytes, 628.
  idiopathic, of newborn pigs, 745.
  in suckling pigs, 456, 596; Ind. 299.
  infectious equine, see Swamp fever.
  milk, in rats, effects of radiant energy, 190.
  nutritional—
    in rats, 346.
    purified glutamic acid as iron supplement, 91.
    value of oysters in diet, 91.
  of infancy and early childhood, 90.
  of infancy, iron and copper for, 485.
  pernicious, vitamin B therapy in, 485.
  production in rats, improved technic, 90.
  rate of development, effect of raw *v.* pasteurized milk, Ohio 65.
  treatment of 126 cases, 486.
Angoumois grain moth, parasite of, 583.
Animal—
  breeding—*see also* Hybridization and specific animals.
    aesthetic notions in, 119.
    in Europe, methods, 445.
  chromosomes, *see* Chromosomes.
  diseases—*see also specific diseases.*
    control in state institution herds, 450.
    in Algeria, 165.
    in Burma, 596.
    in Canada, 450.
    in Madras, 450.
    in Palestine, 313.
  fats, *see* Fats.
  hygiene and preventive veterinary medicine, principles, treatise, 316.
  nutrition, acid-base balance in, 295.
Animal—Continued.
  nutrition, copper in, function, 840.
  pests of useful plants, treatise, 419.
  tissues, infected, reductant power, 310.
Animals—*see also* Cattle, Livestock, Mammals, Sheep, *etc.*
  domestic, in India, helminth parasites, 750.
  domestic, parasites and parasitisms, 597.
  farm, fertility and breeding, 724.
  growth and development, Mo. 586, 626.
  growth, changes in energy and nitrogen metabolism, Mo. 445.
  hypophysectomized, effect of prolan, 283.
  insects and pests affecting health, 566.
  laboratory, diseases in, resistance and susceptibility, Iowa, 450.
  laboratory, spontaneous diseases, anatomy and pathology, 172.
  protective adaptations among, 420.
  small, oxygen consumption, chamber for measuring, 297.
  soil, affecting cane, La. 283.
Annatto, vitamin A in, 481.
Anopheles—*see also* Malaria *and* Mosquitoes.
  atropos, new potential carrier of malaria, 437.
  darlingi as transmitter of malaria, 436.
Anopheles mosquitoes—
  breeding in Louisiana Delta, 436.
  of South Africa, illustrated keys, 437.
Anorexia and vitamin deficiency, 633.
Antelopes as carriers of nematode parasites of ruminants, 70.
Antestia lineaticollis, notes, 417, 702.
Anthelmintics, status of knowledge, 75.
Anthocyanin pigment in corn, new gene for, 515.
Anthonomus—
  grandis, see Boll weevil.
  pomorum, biology, 298.
  quadrigibbus, new description, Colo. 718.
Anthrax bacilli in ticks, fate of, 740.
Anthrax, symptomatic, *see* Blackleg.
Anthrenus scrophulariae, *see* Carpet beetles.
Anthrenus verbasci, parasite of, 57.
Antimony electrode for computation of pH of soils, 203.
Antineuritic vitamin, *see* Vitamin B (B_1).
Antirachitic, see Rickets *and* Vitamin D.
Antiscorbutic, *see* Scurvy *and* Vitamin C.
Ants, white, *see* Termites.
Anusoidea comperei, habits, Calif. 432.
Aphanus sordidus, life history notes, 709.
Aphelenchus spp. on cultivated plants, 402.
Aphelinus mali, parasite of woolly aphid, 283, 285.
Aphidae of Colorado, 58.
Aphididae—
  in Japan, 286.
  of Formosa, 710, 711.
  of Hokkaido, biological studies, 286.

Aphids—
  black hickory, notes, Fla. 559.
  control, 424; Fla. 559.
  control, reduced costs, 560.
  relation to alfalfa seed production, Utah 287.
  vectors of onion yellow dwarf, 432.
  woolly—*see also* Apple aphid, woolly.
    chemically treated bands for, 49.
    control on dormant nursery stock, 284.
    parasite of, 284, 285.
Aphis—
  gossypii, *see* Cotton aphid *and* Melon aphid.
  leguminosae, biology, 426.
  maidis, *see* Corn leaf aphid.
  persicae, *see* Peach aphid, green.
  spiraecola, notes, Fla. 559.
Aphoidea, key to families, 53.
Apiaries—
  inspection, 423; Tex. 705.
  management in California buckeye area, 721.
Apiculture, *see* Beekeeping.
Aplanobacter michiganense, notes, 274; Utah 698.
Apogamy in citrus and Mangifera, importance, 582.
Apoplexy, parturient, *see* Milk fever.
Apparatus—
  electrodialysis, new modification, 13.
  for adding load at steady rate, 770.
  for cooking with heat generated by resistance of food to an electric current, Iowa 493.
  for determining electrical resistance of pear fruit, Oreg. 680.
  for determining replaceable bases in soils, 106.
  for fumigation of woodwork of buildings, 429.
  for measuring oxygen consumption of small animals, 297.
  for measuring water in snow, Utah 654.
  improved lactic acid, 202.
  periodometer, description, 654.
Appetite, loss of, *see* Anorexia.
Apple—
  anthracnose, causal organism, 553.
  aphid, woolly—*see also* Aphids, woolly, in Japan, 286.
  bitter pit, studies, N.H. 536.
  black spot, control, 698.
  blossom weevil, control, 156.
  Brooks' spot disease, control, 412; Ohio 43.
  bud sports, pollination, 252, 677.
  capsid, control, 567.
  curculio, control in Champlain Valley, 719.
  curculio, notes, 424; N.Y.State 150.
  curculio, study of genus and new subspecies, Colo. 718.
  diseases, epidemic in Illinois, 410.
  diseases in Tennessee, Tenn. 551.
Apple—Continued.
  diseases, studies, 410.
  diseases under overhead irrigation, 554.
  fillers, need of prompt removal, Ohio 36.
  fire blight, studies, 552.
  flea weevil, notes, 424.
  foliage, secondary effects of spray injury, Mich. 145.
  fruit rot, notes, 553.
  grain aphid, biology, 49.
  grain aphid, vector of onion yellow dwarf, 432.
  insects in Hudson Valley, N.Y.State 150.
  leaf roll and maturity, studies, N.H. 536.
  leafhopper, white, notes, N.Y.State 150.
  leafhoppers, studies, 424, 709; Calif. 550; Va. 51.
  leaves, stomatal activity, 38.
  maggot, bionomics and control, Iowa 424.
  maggot studies, 424, 427, 716; Mass. 424; N.Y.State 150; Ohio 50; Wis. 706.
  measles, manner of spread, N.Mex. 43.
  nursery stock, potato leafhopper affecting, 709.
  root rot, varietal susceptibility, Ohio 43.
  roots, growth and rest period, 252.
  rootstock, studies, Wis. 674.
  rust diseases in eastern New York, 552.
  rust in Iowa, Iowa 399.
  scab, control, 274, 275, 410, 412, 413, 540, 551; Mich. 144; N.H. 536; Ohio 43.
  scab, control in Bristol Province, 552, 553.
  scab, control in Hudson Valley, N.Y. State 143.
  scab, fall applications of fungicides, 552.
  scab, fungicidal action of dusts and sprays for, 552.
  scab in Western Australia, 413.
  scale, cottony, in Japan, 286.
  seedlings, characteristics, 37.
  seedlings, resulting from crossing varieties, 251.
  sooty blotch fungus, hosts and cultural characteristics, Ind. 536.
  stock and scion, interrelation, Mass. 385.
  stocks, field propagation, granulated peat moss in, 249.
  stocks, selected, growth characteristics, 389.
  tree borer, round-headed, calcium cyanide-raw linseed oil mixture for, defense of, 56.
  trees, branch growth, relation to fertilizers, 677.

Apple—Continued.
- trees, chemical composition, effect of cultural treatment, Ind. 523.
- trees, dust requirement, Ohio 35.
- trees grown in metal cylinders, growth record, 253.
- trees, hardiness in, Mo. 386.
- trees, *irrigation experiment*, 250.
- trees, longevity, relation to training and pruning, Ill. 133.
- trees, reducase in, seasonal distribution, 39.
- trees, *Trametes hispida* on, 699.
- trees, young, nitrogen and carbohydrate metabolism, effect of excessive sodium nitrate, N.H. 679.
- wood, hardiness in, relation to bound water, Iowa 385.

Apples—
- ash analysis, Ohio 35.
- biennial bearing, control, Mo. 386.
- breeding, Iowa 385.
- breeding, statistical analysis, 677.
- bud variation in, 665.
- chemical studies, Ohio 524.
- chromosomal aberrations in megasporogenesis, Ohio 35.
- color and keeping quality, effect of fertilizers, Md. 524.
- color and size, light intensity as factor, 390.
- coloring and ripening with ethylene gas, 392.
- cooling, ice for, Ind. 673.
- cost of growing, harvesting, and storing, Ohio 331.
- *cost of production*, N.J. 613.
- *crab, see* Crab apple.
- culture experiments, Ohio 36.
- Delicious hybrids, persistence of winter injury in, 678.
- dwarf, growing, Conn.State 523.
- effect of drought on size, N.J. 524.
- fertilizer experiments, Md. 524; N.H. 524; Ohio 36; W.Va. 678.
- fruit setting, N.H. 678; Ohio 35.
- Grimes and Jonathan, responses to thinning, 253.
- Grimes, skin structure, 391.
- imported Canadian, wastage types, 411.
- in cold storage, losses, Iowa 385.
- Indian hill, fungi in, cultural study, 45.
- *injuries from summer sprays*, Mich. 144.
- Jonathan, breakdown in, control, 552.
- lenticel infection by *Penicillium expansum*, importance, Wash.Col. 699.
- light and pigment development, 527.
- Maine, marketing, Me. 617.
- McIntosh, cold storage tests with forced air circulation, N.H. 680.
- McIntosh, pollination, 389; Mont. 252.
- nitrogenous materials in during storage, 134.
- Ohio Seedling No. 78, new variety, Ohio 35.

Apples—Continued.
- pollen sterility in, cytological studies, 119.
- *pollen viability, effects of late spring frosts*, 252.
- *pollination*, 249; N.H. 524; N.Y.State 677; Ohio 35.
- *pollination and pollen viability*, N.J. 524.
- pollination of newer varieties, 677.
- propagation, Iowa 385.
- pruning, Mass. 385; Nebr 524.
- red pigment production with artificial light, 254.
- size and composition, relation to distance from leaves, 389.
- spray program, use of oils in, 561.
- spray residue removal from, 560; Idaho 254; Ind. 673; N.Y.State 526.
- spraying, 274.
- spraying and dusting, Ind. 679; *Ohio* 36.
- spraying recommendations, N.J. 38.
- sterility in, Mo. 386.
- stomatal activity and fruit growth, relation to soil moisture, 38.
- storage, Ind. 523, 605.
- storage behavior, effect of nitrogen fertilization, 391.
- storage diseases, relation to water supply of trees, 391.
- storage, effect of fungicides, 680.
- storages, Mass. 462.
- storages, construction and management, Mich. 611; *Ohio* 79.
- stored, changes in, N.H. 524.
- *stored, infection relation to disease*, 700.
- studies, Calif. 526.
- unfruitfulness in, 388.
- varieties, new, value, Mich. 39.
- variety tests, Tex. 673.
- vitamin B complex in, 632.
- vitamin C in, Mass. 473.
- washing by electricity, 175.
- washing studies, N.H. 524.
- yields, relation to soil properties, N.Y.State 253.

Apricots—
- apoplexy in, cause, 45.
- carotenoid content, relation to light, 245.
- Monilia on, 554.
- pollination studies, 249.
- studies, Calif. 526.
- vitamins in, 776.

Arachid pests in northern Caucasus, 706.

Arborvitae, Chinese, tests, Tex. 673.

Areca koleroga, outbreak and control, 264.

Argyrotaenia pinatubana in Yellowstone National Park, U.S.D.A. 707.

Aristobia approximator, notes, 562.

Armillaria mellea in mines and wells, 280.

Arsenic, toxicity on mosquito pupae, Calif. 559.

Arsenical—
  and fluorine insecticides, relative toxicity, 428.
  dusts for dry seed treatment, 266.
  injury to peaches, 563.
  spray residue, *see* Spray residue.
  substitutes for peach spraying, 561.
Arsenicals—*see also* Calcium arsenate *and* Lead arsenate.
  for Mexican bean beetle, tests, 716.
  for potato flea beetle control, Ohio 439.
Artesian basin, drainage and reclamation of lands overlying, 823.
Artichoke roots, globe, composition, Calif. 525.
Artichokes—*see also* Jerusalem-artichokes.
  globe, morphological and chemical studies, 248.
  marketing, Calif. 334.
  rôle in diabetic diet, 93.
  vitamin B (B_1) in, 634.
Artocarpus integrifolia, caterpillar pest of, 426.
Ascaridia lineata—
  acquired resistance of chickens to, 604.
  ova, effect of chemical agents, Ohio 69.
Ascarids—
  in pigs, treatment, S.Dak. 69.
  in poultry, treatment and prevention, 461.
Asclepias spp. fibers, characteristics and textile values, 93.
Ascochyta spp., notes, 694.
Ascogaster carpocapsae, biology, N.Y.State 442.
Ash determination, use of oxygen in, 361.
Ash, European mountain, seeds, afterripening, germination, and vitality, 21.
Ash tree canker, studies, 557.
Asiatic beetle—
  in new territory, Conn.State, 559.
  traps for, 577.
Asparagus—
  breeding, N.J. 524.
  culture, Iowa 385.
  culture experiments, La. 244; Mass. 386.
  diseases in Vale of Evesham, 405.
  fern, red spider on, Fla. 559.
  fern rust, studies, Fla. 536.
  fertilizer experiments, La. 244; Mass. 386; N.J. 524.
  genetic and cytological studies, 664.
  insects in Iowa, Iowa 159.
  shoots, freezing point depressions, 131.
  spacing and culture, Calif. 525.
  spacing experiments, Calif. 246.
Aspartyl-aspartic acid, titration constants, 196.
Aspen suckers, effect of light burning, 687.
Aspergillus attacking mealybugs in insectaries, 265.
Aspergillus—
  niger citric acid fermentation, effect of iron, 445.
  niger, notes, 748.
Aspergillus—Continued.
  spp., effect on temperature of stored grain, 662.
Aspidiotiphagus citrinus, parasite of fern scale, 711.
Aspidiotus—
  hederae, notes, N.J. 561.
  latanias, control, 482.
  makii on pine in Japan, 711.
  perniciosus, *see* San Jose scale.
  prunorum, new in Baluchistan, 152.
  pseudomeyeri on juniper in Japan, 711.
Association of—
  Land-Grant Colleges and Universities, proceedings, 472.
  Official Seed Analysts of North America, proceedings, 522.
Aster—
  foot rot, notes, 405.
  wilt resistant strains, Ind. 523.
  yellows, control, 702.
  yellows resistant strains, 702.
  yellows, wire screen fences for, 702.
Asterocystis radicis, notes, 269.
Asters—
  insects affecting, N.J. 561.
  spraying and dusting experiments, 568.
Attacus ricini, introduction from India into Egypt, 433.
Autoserica castanea, traps for, 578.
Avitaminosis—*see also* Vitamins, deficiency.
  of rats, infection of respiratory tract and middle ear, 491.
Avocado—
  diseases, studies, Calif. 535.
  seed and oil, constituents, Hawaii, 358.
Avocados—
  as supplementary feeds for poultry, Hawaii 302.
  culture experiments, Tex. 673.
  fertilizer experiments, P.R. 525.
  Latania scale affecting, control, 482.
  maturity tests, Fla. 523.
  studies, Calif. 526.
  variety tests, V.I. 525.
Azotobacter inoculation, effect on nitrogen fixation, 658.
Azotobacter spp., nitrogen-fixing activities, 112.
Babesiella—
  berbera, notes, 600.
  bovis, notes, 748.
Baby beef, *see* Cattle, baby beef.
Bacillus—
  abortus—*see also* *Bacterium abortus*, *Brucella abortus*, *Alcaligenes abortus*, *and* Abortion.
    and bursitis in cattle, 742.
  aertrycke, notes, 749.
  amylovorus, notes, 45, 410.
  atrosepticus, notes, 407.
  bombysepticus n.sp., description, 152
  botulinus, *see* *Clostridium botulinum*
  bronchisepticus, agglutination behavior, 481.

Bacillus—Continued.
- *bronchisepticus*, notes, 746.
- *carotovorus*, notes, 148.
- *chauvaei* and *Vibrion septique*, bivalent vaccine against, preparation, 70.
- *chauvaei*, ovine and bovine strains, 72.
- *coli*, notes, 456.
- *enteritidis*, *see* *Salmonella enteritidis*.
- *haemoglobinophilus coryza gallinarum*, description, 171.
- *influenzae* group in fowls, 602.
- *mallei*, variant types, 451.
- *oedematiens*, notes, 73.
- *ovitoxicus* n.sp., notes, 600.
- *pullorum* infection of fowls in Chile, 748.
- *radicicola*, *see* Nodule bacteria.
- *rhusiopathiae*, notes, Calif. 595.
- *rhusiopathiae suis* in Brazil, 456.
- *tuberculosis* in mice on vitamin A deficient diet, effect of carotene, 778.
- *typhi murii*, permeability of intestinal tract to, effect of vitamin A deficiency, 463.
- *welchii* and *Bacterium paludis*, comparison, 73.
- *welchii*, notes, 600.

Bacteria—
- crown gall and hairy root types, differentiation, 538.
- growth measurement, technic, 374.
- in milk, soil, etc., *see* Milk, Soil, *etc.*
- of enteric group in poultry 170.
- physiology, treatise, 738.
- phytopathogenic, agglutination tests with, 538.
- producing trimethylene glycol, 681.

Bacteriologic culture media, *see* Culture media.

Bacteriology—
- and immunity, principles, treatise, 738.
- recent advances in, treatise, 310.

Bacterium—
- *abortus*—*see also* *Bacillus abortus*, *Brucella abortus*, *Alcaligines abortus*, *and* Abortion.
  - in blood, urine, and feces of cattle, 314.
  - in milk, 314.
  - relation to fistula and poll-evil of horses, 168.
- *aloes*, proposed name, 703.
- *anatum*, notes, 749.
- *betivorus*, notes, 148.
- *citri*, *see* Citrus canker.
- *coli*, *see* *Bacillus coli*.
- *cypripedii*, notes, 148.
- *malvacearum*, studies, 536, 537.
- *paludis* and *Bacillus welchii*, comparison, 73.
- *paludis*, notes, 600.
- *phaseoli*, seed infection by, 545.
- *pruni*, notes, 414; U.S.D.A. 145.
- *pseudotuberculosis rodentium*, studies, 598.
- *pullorum*, *see* *Salmonella pullorum* and Pullorum disease.

Bacterium—Continued.
- *radicicola*, *see* Nodule bacteria.
- *radiobacter* and *B. tumefaciens*, comparison, 538.
- *savastanoi fraxini*, proposed name, 557.
- *solanacearum*, notes, 407, 409; Fla. 535.
- *tabacum*, control, Pa. 45.
- *tabacum*, migration through tobacco leaf tissues, 550.
- *translucens* and *B. translucens* v. *undulosum*, studies, 542.
- *tularense* in American dog tick, 72.
- *tularense* in tissues of sage hens and infesting ticks, 455.
- *tumefaciens* and *B. radiobacter*, comparison, 538.
- *tumefaciens*, notes, 698.
- *vascularum*, notes, 263, 271.

Bahia grass—
- breeding, Fla. 516.
- growth behavior and yields, Fla. 516.

Baits, use in pest control, 285.

Baking—
- ingredients, analyses, 364.
- powders, reaction in doughs, 388.
- procedure, experimental, standardization, Nebr. 621.

Bamboo—
- Loranthaceae outbreak on, 557.
- shot borer, smaller, on tobacco, 150.

Banana—
- aphid, notes, 702.
- diseases, 415.
- Panama disease, studies, 276, 401, 415, 416.
- roots, *Tylenchus musicola* affecting, 277.
- squirter disease in Australia, 276.
- virus disease, new, 701.
- wilt fungus, relation to abaca, 405.
- wilt, symptoms, 416.

Bananas—
- as supplementary feeds for poultry, Hawaii, 302.
- breeding, 395.
- changes in osmotic pressure during ripening, 260.
- culture experiments, Tex. 678.
- ripening, effect of ethylene, 156.
- vitamin B complex in, 682.

Banks—
- country, of Texas, economic efficiency, Tex. 615.
- intermediate credit system, papers on, U.S.D.A. 614.

Barathra brassicae, notes, 286.

Barberry, susceptibility and resistance to stem rust, U.S.D.A. 548.

Barium—
- fluosilicate and nicotine sulfate, incompatibility, 49, 658.
- fluosilicate, insecticidal value, 487; La. 282.
- peroxide, formation, 128.

Bark beetles—
German, types of mines, 285.
of olives, 285.
Barley—
and oats mixtures, tests, Ohio, 517.
behavior in grinding, 177.
breeding, Nebr. 517; Tex. 668; U.S.D.A. 28.
covered smut, liquid and dust disinfectants for, 541.
crosses, studies, 663.
culture experiments, 123; Ohio 517.
diseases, 538.
feeding value, Tex. 723.
fertilizer experiments, 123, 124.
for dairy cows, fineness of grinding, Wis. 731.
for hogs, fineness of grinding, Wis. 723.
genetic studies, Mo. 378.
growth curves, 371.
Helminthosporium diseases in South Africa, 403.
improvement, N.J. 517.
inheritance in, 375.
leaf rust, varietal susceptibility, U.S.D.A. 266.
loose smut, development and control, U.S.D.A. 138.
malting value, effect of fertilizers, 123.
natural crossing in, 231.
powdery mildew, varietal susceptibility, U.S.D.A. 266.
residue, effect on crop yields, 81.
seed treatment tests, Iowa, 378.
stripe disease, control, 548.
susceptibility to fusarial head blight, 542.
tests, Wyo. 379.
v. rye with corn for hogs, Wyo. 59.
varieties and strains, N.J. 123.
varieties, purification, Calif. 516.
variety and breeding, Wis. 669.
variety tests, Iowa 378; Mo. 378; N.Dak. 667; N.Mex. 29; Nebr. 517; Ohio 517; Tex. 668; U.S.D.A. 28; Wyo. 30.
vitamin A in, Calif. 588.
winter strains, tests, Ohio 30.
yields, Ind. 667.
yields at Woburn, 123.
yields, relation to weather, 123.
Barns, all-masonry, studies, Iowa 462.
Barns, ventilation system, efficiency, Iowa 462.
Barrows, dressed yields, Ohio 58.
Basisporium gallarum, pathogenicity to corn, Iowa 399.
Bassus spp., new North American, 584.
Bats, fruit, in Australia, 420.
Bay oil, utilization and preparation, P.R. 525.
Bayberry seeds, germination, 262.
Bean—
aphid, vector of onion yellow dwarf, 482.
bacterial blight, Tex. 690.
Bean—Continued.
bacterial disease transmitted by thrips, 51.
beetle, Mexican—
active and hibernating adults, histological differences, 577.
control, 716; Conn.State 559; N.Mex. 155; N.Y.State 717.
eggs, effects of temperature and moisture, 577.
in Connecticut, 717.
notes, N.J. 561.
blight and rot, studies, La. 263.
diseases, control, Calif. 535.
diseases, pathological histology, 544.
dry root rot, notes, 405.
fly, notes, 426.
Fusarium disease, 545.
jassids, control, Fla. 559.
lace bug, notes, 289, 710.
leaves, change of substances in during vegetation, 372.
mosaic in England, 268.
powdery mildew, notes, Fla. 538.
seed, quality on sale in New York, N.Y.State 130.
seeds, infection by *Bacterium phaseoli*, 545.
thrips, control, Calif. 559.
yellows disease, Fla. 536.
Beans—see also Soybeans.
behavior in grinding, 177.
California, composition and time for cooking, 770.
canned green, pellagra-preventive value, 488.
canning, mosaic resistant, Wis. 690.
culture, Hawaii 385.
culture experiments, La. 244.
fertilizer experiments, Ill. 36; La. 244.
for New York, N.Y.State 674.
garden, history and botany, N.Y.State 525.
growth and soil reaction, relation, 37.
growth, effect of pH of soil, 140.
Hopi Lima, breeding, Calif. 516.
in Canada, 238.
leaf dimensions in, growth and inheritance, 665.
Lima, baby, from machine-threshed seed, seedling injury, 525.
Lima, baby, thresher injury, Calif. 525.
Lima, cost of production, N.J. 613.
Lima, iron in, U.S.D.A. 85.
New Mexico varieties, palatability and losses in cooking, N.Mex. 86.
pinto, irrigation, duty of water for, N.Mex. 76.
pinto, vitamins B (B_1) and G (B_2) in, N.Mex. 88.
production and marketing, Mont. 332; N.Y.Cornell 616.
seed improvement studies, Mass. 386.
snap, fertilizer and variety tests, La. 130.
snap, fertilizer experiments, Miss. 35.
standard descriptions, 121.

Beans—Continued.
 susceptibility to *Fusarium martii phaseoli*, effect of soil reaction, 141.
 varieties, hardshell seeds in, N.Y.State 674.
 variety tests, N.Mex. 29; P.R. 517; Wyo. 30.
Beauveria spp. attacking European corn borer, 290.
Bee hole borer, life history and natural enemies, 562.
Bee journals, American, catalog list, 156.
Beech—
 scale in New England, 50.
 tolerance to insecticides, 568.
 trees infested by beech scale, fate, 285.
Beef—*see also* Cattle, beef.
 amino acid deficiencies, for growth in rats, 627.
 cooking methods, Mo. 473.
 lean, vitamin B_1 in, effect of cooking and canning, N.Dak. 778.
 quality and palatability, effect of sex, Iowa 445, 725; Mo. 445.
 slimy, bacteriology, 446.
 yearling, market classes and grades, U.S.D.A. 60.
Beehives, wood substitute for, 720.
Beekeeping, La. 283; N.Dak. 705; Tex. 705; Wyo. 57.
 in Canada, Can. 440.
 manual, 721.
Bees—*see also* Honey.
 activity in orchards, 441.
 and other insects in orchard, 561.
 as pollinating agents of sweetclover, S.Dak. 51.
 brood area and colony size as factors in pollination, 580.
 carpenter, life history, 441.
 Caucasian and Italian, comparison, Wyo. 440.
 changes in nectar concentration produced by, Iowa 720.
 device for facilitating pollen distribution by, 389.
 different colonies, comparative value in pollination, 581.
 disease eradication, Ohio plan, 156.
 disease reduction, Conn.State 559.
 effect on clover and alfalfa seed production, Mich. 384.
 foulbrood, *see* Foulbrood.
 hybrid, resistance to plant poison in California, 720.
 in orchard, management, 561.
 in winter cluster, metabolism, Wyo. 440.
 package, development of colonies, U.S.D.A. 581.
 queen, multiple matings, 705.
 rôle in spread of fire blight, 294.
 studies, N.J. 561.
 value for pollination, 156, 424, 427; Md. 524.
 winter activity, 156.
 wintering, 156.
Beet—
 carrion beetle, control, 284, 426.
 fly, treatise, 291.
 leafhopper, artificially feeding, 568.
 leafhopper, control, Calif. 559.
 leafhopper, field studies, Idaho, 52.
 leafhopper in Utah, 431; Utah 568.
 leaves, change of substances in, during vegetation, 372.
 leaves, deformation, 545.
 pulp, dried, feeding value, Nebr. 298.
 seed, quality on sale in New York, N.Y.State 130.
 seed treatment, 522.
 tops, iron in, U.S.D.A. 85.
Beets—
 fertilizer experiments, Ill. 36.
 field or fodder, *see* Mangels.
 growth and soil reaction, relation, 37.
 selection studies, Ohio, 524.
 sugar, *see* Sugar beets.
 variety tests, Calif. 525; Conn.State 523.
Bemisia, new species of Formosa, 432.
Bentgrass—
 fertilizer requirements, R.I. 233.
 seed production, R.I. 233.
Bentonites, base-exchange reactions, equilibria, 14.
Berries, *see* Fruits, small, *and* Raspberries, Strawberries, *etc.*
Beryllium, effect on citrus, Calif. 278.
Betel vine rot, notes, 264.
Bibliography of—
 amino acids, history of discovery, 356.
 Aphelenchus genus, 402.
 Aphididae of Formosa, N.Y.State, 711.
 apple curculio, control, 719.
 bacteriology, 310.
 Bacterium abortus in milk, 314.
 bean lace bug, 289, 710.
 bees, carpenter, 441.
 bees, package, development of colonies, U.S.D.A. 581.
 beet leafhoppers, Idaho 52.
 bibliographies on chemistry, 645.
 birds of Florida, 421.
 biting flies in Adirondacks, 716.
 blowflies, eggs and larvae, sterilization and growth, 437.
 brick reinforced masonry slabs, 753.
 Brucella infections, diagnosis, Mich. 166.
 Capillaria genus, 149.
 cecidiology, 437.
 cellulose and lignin, 646.
 Cephalonomia quadridentata, morphology and ecology, 443.
 chemistry, agricultural, 12.
 chinch bug, 431.
 coccidiosis in fowls, 220.
 cocklebur control by insects, 576.
 cotton, cytology and genetics, 227.
 deer, helminth parasites of, 665.
 dyes, visual spectrophotometry, U.S.D.A. 654.
 egg yolk proteins, 645.

Bibliography of—Continued.
Elateridae of China, 717.
ergot, 119.
Escherichia coli, Pa. 452.
ethylene dichloride, U.S.D.A. 6.
Euryope terminalis, embryological development, 293.
farm structures, research in, U.S.D.A. 177.
Farnham House Laboratory, organization and progress of work, 287.
fats, need in diet, 475.
fermentation of carbohydrates, U.S.D.A. 359.
4-H club work in United States, U.S.D.A. 472.
grape berry moth, 572.
helminthic infections, 750.
hornets, nest population, 582.
house insulation, 782.
insects, behavior, 289.
insects, immunity in, 423.
insects of Iceland, 426.
insects, respiration, 423.
Leucostoma leucostoma and *Valsa japonica*, 145.
louping-ill, 167.
Lyperosia exigua, 576.
market diseases of fruits and vegetables, U.S.D.A. 270.
microfilariasis, equine, 745.
mosquitoes, anopheline, of China, 715.
mosquitoes in Philippines, daytime resting places, 291.
nematodes, 283.
neoplasms of domestic animals, 310.
pellagra, 349.
pellagra and solar radiation, 488.
plant diseases, epidemic, 43.
plant diseases, relation to environment, Ohio 689.
plum curculio, Del. 439.
rickets, 599.
Salmonella pullorum and related species, dissociation, Mich. 170.
sawfly, wheat stem, parasites, 157.
scoliidae, natural enemies, U.S.D.A. 582.
seeds, 522.
Sitona lineata, 293.
sugarcane varieties, improvement, 129.
teeth decay, 480.
wheat species, systematics, genetics, and cytology, 673.
white flies of India, 151.
wool quality, 94.
worm parasites of rats transmissible to man, 282.
Binding twine, Danish, tests, 608.
Biocenometer for determining insect fauna of grass cover, 284.
Bioclimatics, relation to other sciences, 210.
Biologic products, preservation, efficiency of germicides, 739.
Biprorulus bibax, life history, 288.
Birch leaf miner, notes, 585.
Bird Preservation, International Committee, 149.
Birds—
and beasts as farm pests, treatise, 149.
as host for chiggers and other ectoparasites, 49.
carbohydrate metabolism in, 340.
game, protection, 281.
handbook, 420.
locust-eating, notes, 286.
Nearctic, food habits, 420.
of Alaska, laws and regulations, U.S.D.A. 280.
of Egypt, treatise, 149.
of Florida, 421.
of French Indo-China, 421.
of Louisiana, 421.
of New Jersey, sylvids and flycatchers, N.J. 49.
of Oklahoma, 281.
of seashore, treatise, 281.
of South Carolina, supplements, 281.
reproduction in, physiology, 122.
secondary poisoning, 281.
sexual maturity and season of origin *as determiner of age*, 122.
that hunt and are hunted, treatise, 420.
watching, guide to field observation, 420.
wild, of Quebec, parasites, 461.
Bitterweed, poisonous to livestock, Tex. 740.
Black disease in Tasmania, 73.
Black flies of Adirondacks, 716.
Black fly, citrus, hydrocyanic acid gas concentration for control, 711.
Black onion fly, notes, 705.
Black quarter and malignant edema, 70.
Black wattle, seed selection in, 137.
Blackberries—
Brainerd, new variety, description, U.S.D.A. 135.
breeding, R.I. 244.
of North America, key and descriptions, 258.
redberry disease of, 425.
seed and berry size, 394.
use for vinegar, Fla. 619.
varieties for jelly making, Fla. 620.
varieties, promising, 258.
variety tests, Tex. 673.
Blackhead—
epizootologic behavior, Nebr. 602.
in turkeys, Mo. 457; R.I. 318.
Blackleg immunization, 740.
Blacktongue in dogs, rôle of iron deficiency, 92.
Blatella germanica, intermediate host of *Tetrameres americana* of poultry, 288.
Blindness in fowls, effect of rations, Iowa 444.
Blissus leucopterus, see Chinch bug.
Blister beetle, striped, life history, 56.
Blister beetles—
notes, N. Mex. 50.
relation to alfalfa seed production, Utah 287.

Blitophaga opaca, control, 284, 426.
Blood—
- alcohol in, interferometric determination, 209.
- clotting function and avitaminosis, 486.
- coagulation, effect of damaged sweetclover feeding, 316.
- flour v. skim milk powder for calves, Ohio, 65.
- iron in, determination, 105.
- of dairy cattle, studies, Mo. 447.
- of pigs, cellular changes in during hog cholera, 317.
- pressure in animals, 71.
- regeneration studies, 628.
- serum, amino acids in, determination, 104.
- serum, calcium in, 185.
- sugar level in vitamin B (B_1) deficiency, 635.
- sugar level of dairy cattle, 448.

Blowflies—
- baits for, 575.
- eggs and larvae, sterilization and growth, 487.
- sheep, biology, 154.

Blueberries—
- fertilizer experiments, N.J. 524.
- growth of roots and tops, N.J. 524.
- production, N.H. 524.
- propagation, Mass. 385.
- variety tests, Mass. 385.

Blueberry—
- fruit worm, notes, Fla. 559.
- maggot, biology and control, U.S.D.A. 55.
- maggot, passing from one blueberry into another, 558.

Bluegrass—
- growth with various defoliations and abundant nitrogen, 126.
- white grub injury, relation to environment, 292.

Boll weevil—
- abundance, relation to summer weather and food, Ark. 579.
- control, Fla. 559.
- in hibernation cages, emergence and percentage of survival, 439.
- ingestion of poison and hibernation, Tex. 705.
- Thurberia, in Arizona, 423.

Bollworm—
- cooperative studies, Tex. 705.
- on carnations, 428.
- pink—
  - cooperative studies, Tex. 705.
  - in Arizona, 423.
  - in Puerto Rico, 714.
  - infestation of young okra pods, 573.
  - notes, 286.
  - summary, V.I. 573.
- spotted, notes, 286.

Bombyx mori, see Silkworms.

Bone—
- ground, analyses, N.J. 115.
- meal, feeding value, 569.
- solubility in solutions of magnesium salts, 199.

Bones, tibiae, of chicks, calcium-phosphorus ratio, 63.

Books on—
- acidimetry, applied, principles, 203.
- agricultural machinery technic, 468.
- animal hygiene and preventive veterinary medicine, principles, 310.
- animal pests of useful plants, 419.
- animals and birds as farm pests, 149.
- bacteria, physiology, 738.
- bacteriology and immunity, principles, 738.
- bacteriology, recent advances in, 810.
- beekeeping, 721.
- birds, 420.
- birds and beasts as farm pests, 149.
- birds of Egypt, 149.
- birds of Florida, 421.
- birds of seashore, 281.
- birds that hunt and are hunted, 420.
- birds, watching, 420.
- botany, principles and problems, 20.
- bridges and roofs, 754.
- building materials, 324.
- buildings, framed, 753.
- bulbs for American gardens, 397.
- cattle, beef, raising, 445.
- cecidiology, 437.
- chemistry, agricultural, 195.
- chemistry, capillary, 195.
- chemistry, physical, 356.
- chemistry, systematic organic, 195.
- clothing and textiles, 349.
- dust explosions, 468.
- electric heating, 191.
- engines, internal-combustion, and tractors, 825.
- entomology, medical, 566.
- fermentation, alcoholic, 201.
- fertilizers for greenhouse and garden crops, 245.
- food and nutrition, 768.
- food of the family, 336.
- forest entomology, 287.
- forest mensuration, 688.
- gardens, hardy flower, 398.
- gardens, maintenance, 398.
- gardens, old, in and about Philadelphia, 398.
- heating, electric, 191.
- hematology, clinical, of domestic animals, 810.
- home making, 493.
- horses, breeding, 62.
- ice making, 331.
- insect life, fundamentals, 422.
- insects and injuries from, 422.
- insects, behavior, 289.
- insects of farm and garden, 149.
- lumber and uses, 399.
- marketing agricultura
- meteorology, 654.

Books on—Continued.
microorganisms, pathogenic, 788.
microscope, use, 201.
microscopy, practical, 202.
nutrition and diet in health and disease, 337.
ornithological nomenclature, 558.
Pegomyia hyoscyami, 291.
perennials, 261.
permeability, 508.
pheasants, 422.
plant diseases, 488.
plant pathogens, bacterial, 688.
plants, animal pests of, 419.
protozoology, 282.
rabbits, breeding, 420.
rickets, 598.
roofs and bridges, 754.
roses, 397.
Ruffin, E., gentleman farmer, 336.
snakes of the world, 282.
sociology, rural, 766, 767.
soil microbiology, 109.
soil science, 109.
spinach leaf miner, 291.
squirrels, American gray, in the British Isles, 148.
textiles and clothing, 349.
tractors and internal-combustion engines, 325.
vegetables, culture, 36.
veterinary obstetrics and zootechnics, 449.
vocational agriculture, teaching methods, 336
water supply, 172.
waterfowl, protection and increase, 281.
zoology, agricultural and forest, fundamentals and laws, 419.
Boophilus decoloratus, anthrax bacilli in, fate of, 740.
Bordeaux mixture—
factors affecting suspension properties, 540.
for spraying potatoes, proportion of lime, Ohio 43.
instant, preparation, W.Va. 138.
Borkhausenia pseudospretella—
damage to books, 289.
habits, 578.
Boron, relation to growth and spore formation of fungi, 23.
Bostrychids, Egyptian, notes, 285.
Botany—
aid and lexicon, 20.
principles and problems, treatise, 20.
Strasburger's textbook, 20.
Botryosphaeria in Hawaii, 402.
Botrytis—
cinerea Pers., new form on flax, 695.
cinerea strains, differences in, 536, 537.
fabae n.sp., description, 410.
Bottle breakage in milk plants, factors in U.S.D.A. 67.
Botulism, protective measures of California against, 486.
Boutonneuse fever—
transmission by brown dog tick, 741.
virus, dog as reservoir, 597.
Boys, physical growth, 771.
Brambles—
culture experiments, Miss. 35.
pruning, Miss. 35.
variety tests, Miss. 35.
Brass, atmospheric corrosion, 464.
Brassica pekinensis, self-incompatibility in, 247.
Braxy-like disease of sheep in Western Australia, 600.
Bread—*see also* Flour.
composition, 387.
of various kinds in Poland, biological value of proteins, 620.
vitamin B in, 483.
Breadfruit, propagation, Hawaii 385.
Breeding, *see* Animal breeding, Plant breeding, *and specific animals and plants.*
Brick, reinforced, masonry slabs, performance characteristics, 752.
Brickwork, reinforced, new construction material, 751.
Bridge types, highway, 608.
Broccoli—
breeding, Calif. 525.
breeding and selection, N.Dak. 673.
leaves, iron in, U.S.D.A. 85.
Bromegrass, tests, N.Mex., 29.
Bromine, effect on mosquito larvae, 55.
Bromus spp., microsporogenesis and embryogeny in, 119.
Bronchitis, infectious, *see* Laryngotracheitis.
Bronze, atmospheric corrosion, 464.
Brooders—
carbon lamp, use, 175.
electric, construction and operation, Calif. 811.
electric, studies, Ind. 303; Mo. 462.
Brooks' fruit spot, studies, 412; Ohio 43.
Broomcorn—
varieties on heavy plains soils, Okla. Panhandle 380.
variety tests, Tex. 668.
Brown chafer, control in coniferous nursery stock in Scotland, 293.
Brucella—
abortus—*see also Bacillus abortus, Bacterium abortus, Alcaligenes abortus, and* Abortion.
cause of disease in horses, 169.
in cattle and swine, 454.
in cattle, variants and thermal death time, Calif. 595.
in fetal membranes of full-time, reacting cows, 312.
in guinea pigs, prevention, 166.
in hygroma of knee of cattle, 741.
in swine, Calif. 595.
infected guinea pigs, agglutinins in tissue extracts, 166.
infection in Iowa, 312.

Brucella—Continued.
- *abortus*—continued.
  - infection of udder, 313.
  - porcine strains, lethal temperatures, 71.
  - *suis* in blood stream of swine, 453.
- *melitensis* v. *suis*, effect of pasteurization, 454, 734.
- spp., fermentation of organic acids by, 312.
- *suis* in anti-hog cholera serum and virus, Mich. 71.

Brucella—
- *antibodies in human serum*, 598.
- genus, agglutinin absorption studies, 312.
- group, microbic dissociation in, 71.
- infection in animals and man, diagnosis, Mich. 166.
- infection in horses, 602.
- infection, *susceptibility* of chickens to, 457.
- infections in Tunis and Malta, 166.
- strains, agglutinin-absorption data, 597.

Brush for applying creosote to gipsy moth egg clusters, U.S.D.A. 53.

Buckwheat—
- fertilizer experiments, N.J. 507.
- middlings, feeding value, N.J. 594.

Bud moth—
- eye-spotted, control, N.Y.State 289.
- eye-spotted, in Nova Scotia, 436.
- eye-spotted, new in Utah, 427.
- lesser, new in Utah, 427.

Buffalo fly in Australia, 576.

Buffalo treehoppers, control, Wis. 706.

Building materials—
- heat conductivity, effect of moisture, 464.
- treatise, 324.

Buildings, framed, theory and practice, *treatise*, 753.

Bulbs for American gardens, treatise, 397.

Bulls—*see also* Sires.
- young, perpetual lesions in, 596.

Bunostomum spp. in sheep and goats, control, 602.

Bunt, *see* Wheat smut, stinking.

Buprestid, black, of fruits, 285.

Bureau of—
- Agricultural Economics, classified list of projects, U.S.D.A. 612.
- Home Economics, classified list of *projects*, *U.S.D.A.* 612.
- Public Roads, list of publications, U.S.D.A. 463.

Burgundy mixtures, studies, N.H. 536.

Burr seed fly, Bathurst, in New South Wales, 716.

Bursitis in cattle, relation to *Bacillus abortus*, 742.

Bush sickness in New Zealand, 741.

Business cycle, relation to agriculture, 469.

Butter—
- bacteriology, Iowa 308, 447.
- churning, N.J. 594.

Butter—Continued.
- cultures from mixtures of organisms, *development*, Iowa 308.
- making, neutralizing cream for, N.Dak. 731.
- molds and yeasts in, determination methods, 162.
- molds in, churn as source, 68.
- red-spotted molded, 163.
- vitamin A in, effect of *ultra-violet* light, Ind. 631.

Butterfat—
- abnormal, effect of ration restricted *to alfalfa hay*, Calif. 593.
- Babcock test for, application and use, Ill. 449.
- globules, clumping, relation to electric charges, Wis. 731.
- inheritance, contribution of dam in, 66.
- percentage in milk, effect of environmental temperature, 160.

Butterflies—
- of District of Columbia and vicinity, 432.
- *of Lahore*, 570.

Buttermilk—
- churned, quality, Calif. 593.
- fat in, studies, Iowa 447.

Butternut, tolerance to insecticides, 566.

Byturus tomentosus, control, 284.

Cabbage—
- breeding, Calif. 525; La. 244; Tex. 673.
- butterfly, ecology, 285.
- butterfly larvae infected by parasites, changes in body of, 433.
- *California*, composition and *time for* cooking, 770.
- Chinese, breeding and selection, N.Dak. 673.
- *Chinese, vitamins in, Hawaii* 473.
- culture experiments, La. 244.
- fertilizer experiments, La. 130, 244; *N.Mex.* 35.
- irrigation, duty of water for, N.Mex. 76.
- maggot, control, 716.
- moth, control by nonarsenical sprays, 152.
- narcotine in, 649.
- response to fertilizers, 36.
- *Rhizoctonia* head rot, effect of warm, moist weather, Wis. 690.
- selection studies, Mo. 386.
- strain tests, Ohio 524.
- *variety and strain tests*, 246.
- variety tests, Tex. 673.
- vitamin B (B_1) in, 684.
- yellows and seed bed diseases, 544.
- yellows resistant strains, Iowa 399; Wis. 690.

Cacao—
- black pod and canker, notes, 399.
- root disease, notes, 399, 400.
- witches'-broom disease, notes, 399.

Cacoecia [illegible]—
- notes, U.S.D.A. 44.
- studies, 273, 402.

Caconema radicicola—Continued.
- susceptibility of fruits to, U.S.D.A. 85.

Cactus—
- jointed, eradication, 242, 243.
- pricklypear, control, 289.
- pricklypear, feeding to sheep, effects, 70.
- spineless, feeding value, Tex. 723.

Cake, angel-food, from thick and thin portions of egg white, 621.

Cake flour, testing methods, 338.

Calciferol—
- and vitamin D_2, identity, 201.
- properties, 201.

Calcium—*see also* Lime.
- and phosphorus determinations, rabbit as experimental animal, 296.
- arsenate as fungicide, 547.
- chloride, effect on Portland cement concrete, 464.
- compounds, nutritive efficiency for pigs, 61.
- cyanide-raw linseed oil mixture for round-headed apple tree borer, defense of, 56.
- excess, in irradiated ergosterol hypercalcemia, source, 487.
- fluosilicate as Natal fruit fly poison, 427.
- fluosilicate compound and calcium fluosilicate, differentiation, 708.
- gluconate, assimilation of calcium from, 732.
- in blood of children, distribution, 184.
- in cheese, 625.
- in forest litter of Connecticut, 686.
- in saliva and blood, stability, 185.
- metabolism in dairy cattle, 731, 732.
- metabolism in rats, effect of irradiated ergosterol in large doses, 89.
- metabolism of infants on undiluted milk, 340.
- monosulfide, substitute for lime-sulfur for summer spraying, 699.
- nutrition of tomatoes, N.J. 524.
- relation to growth and spore formation of fungi, 23.
- requirement of brood sows, Mo. 590.
- retention on diet containing American Cheddar cheese, 625.
- salts, insoluble, for poultry, Wis. 723.
- sulfate, *see* Gypsum.

Calf diphtheria, Wyo. 70.

California Station, report, 637.

California University, notes, 95.

Calla lily root rot, control, Ohio 556.

Callidium antennatum, notes, 579.

Calliphora spp. on sheep in Queensland, 154.

Calopepla leayana, notes, 562.

Calorimetry—
- animal, chamber for, 297.
- clinical, 87, 478.

Calasota [illegible], notes, 584.

Calves—
- beef, fattening rations, Mich. 60.

Calves—Continued.
- beef, wintering, Nebr., 589.
- digestibility of milk by, effect of fat, Iowa 447.
- fattening in dry lot v. pasture, Ohio 297.
- fattening, mineral mixtures for, Iowa 444.
- fattening, preparation of rations, Tex. 723.
- feeding experiments, Mo. 445.
- finishing for market, W.Va. 725.
- marketed from North Dakota, classes and grades, N.Dak. 616.
- minimum milk requirements, N.J. 594.
- newborn, nonvirulence and resistance to B.C.G. vaccine, 816.
- raising, methods, 733.
- winter rations, 725; Mich. 60.

Camaromyia bullans in New South Wales, 716.

Campsomeris aureicollis, biology, 442.

Campsomeris sp., notes, 562.

Cancer tissues, chromosome numbers in, 513.

Cane grubs, control, 438.

Cankerworm, fall, new in Utah, 427.

Canned foods—
- in Asia, Africa, and Oceania, import duties and taxes, 335.
- vitamins in, 88, 480, 776.

Canning, home, for family use, Ill. 769.

Canning methods, home, Ind. 637.

Cantaloupe, *see* Muskmelon.

Capillaria hepatica, structure and relationships, 149.

Capnodis tenebrionis, notes, 285.

Capnodium citri, notes, 47.

Capons, injection of male and female hormones into, effect, 122.

Capsid bugs, control on black currants, 284.

Carbohydrate—
- derivative, new, description, 645.
- metabolism in birds, 340.

Carbohydrates, fermentation, production of organic acids from, U.S.D.A. 359.

Carbon—
- bisulfide fumigation of woodwork of buildings, 429.
- dioxide—
  - assimilation, limiting factors, 659.
  - determination, 206.
  - evolution by plant materials, 4.
  - from organic matter in soil, 223.
  - penetration into Valonia, 372.
  - production in soils, determination, Iowa 106.
- disulfide—
  - fumigation, effect on rice quality, 286.
  - injection beneath soil surface, 329.
- monoxide poisoning, danger from, 754.
- tetrachloride and—
  - ethylene dichloride as fumigant for clothes moths and carpet beetles, 566.

Carbon—Continued.
tetrachloride and—continued.
tetrachlorethylene, comparison, 452.
Carbonates, insecticide action, 426.
Carnation blight, notes, Mass. 309.
Carnations—
breeding, Iowa 385.
growth under glass, effect of nutrients, Mass. 385.
insects affecting, 428.
sand culture studies, N.J. 524.
yields, effect of soil steaming, 685.
Carotenase in dog liver, 647.
Carotene—
added to vitamin A-free diet, effect on tuberculosis in mice, 778.
after absorption in animal organism, fate, 342.
and vitamin A, distinguishing properties, 501, 646.
and vitamin A, observations and measurements, 630.
as source of vitamin A, Wis. 723.
dosage for vitamin A, 482.
provitamin A properties for poultry, 631.
pure, and vitamin A, 200.
Carpentry construction, master specifications, 78.
Carpet beetle, varied, parasite of, 57.
Carpet beetles, immature stages, fumigation, 566.
Carpocapsa pomonella, see Codling moth.
Carrot—
leaf blight, notes, Fla. 536.
leaf psyllids, notes, 284.
rust fly, biology and control, Mass. 424.
rust fly in New York, 424.
seed, germination experiments, Calif. 525.
seed, quality on sale in New York, N.Y.State 180.
seed, viability, relation to point of origin, Calif. 525.
weevil, notes, 579.
Carrots—
California, composition and time for cooking, 770.
fertilizer experiments, Ill. 36.
flower development, 247.
growth and soil reaction, relation, 37.
raw, cooked, and home canned, vitamin C in, S.Dak. 88.
variety tests, Conn.State 523.
vitamin B complex in, 343.
vitamins in, 88.
Case bearers on cherries and apples, oil sprays for, Wis. 706.
Casein—
manufacturing machinery, Calif. 606.
supplements, effect on corn and soybean rations, 295.
vitamin A free preparation new technic, 647.
Caseins, variations in biological properties, 187.
Castanea vesca, extension of *Loranthus europaeus* to, 48.
Castor oil plant pests in northern Caucasus, 706.
Catalase activity in—
barley, relation to growth curve, 371.
Grimes Golden apples, 390.
tomato fruits at different stages, 249.
Catalpa sphinx, notes, 568.
Catarrh—
contagious, of poultry in Netherlands, 171.
in poultry, different forms, 603.
Caterpillar, processionary, in Pieve forests, 285.
Cattle—*see also* Calves, Cows, Heifers, Livestock, *and* Steers.
baby beef, feeding experiments, Tex. 723.
barns, construction, 79.
beef—
calcium and phosphorus metabolism during pregnancy and lactation, Calif. 588.
feeding and nutrition studies, La. 294; Ohio 58.
feeding experiments, Nebr. 589.
grazing studies, Fla. 588.
raising, treatise, 445.
blood studies, Mo. 447.
breeding, ages and proven sires in, Iowa 724.
calcium, phosphorus, and nitrogen metabolism, effect of mineral supplements, 731.
college herd, history and production, Conn.Storrs 733.
compounding rations for, 724.
crossbreeding tests, S.Dak. 65.
dairy—*see also* Cows.
blood sugar level, 448.
diseases, 313.
feeding and management, Iowa 447; La. 303.
feeding experiments, Hawaii 448; Ohio 65.
growth studies, Nebr. 594.
palatability of native hay for, Wyo. 65.
fattening, Ind. 588.
feeding, returns per acre, Ohio 590.
feedlot fattening rations, Colo. 59.
growth, functional study, 733.
grubs, losses from, reducing, Mich. 55.
grubs, oesophageal stage larvae, 168.
Holstein, breeding circuit, N.Dak. 731.
marketed from North Dakota, classes and grades, N.Dak. 616.
plague, *see* Rinderpest.
poisoning, *see* Livestock poisoning, Plants, poisonous, *and specific plants.*
ranches of Nevada, analysis and costs, Nev. 471.

Cattle—Continued.
- safe limits for rock phosphate, Wis. 731.
- Shorthorn, breeding methods, 231.
- ticks, *see* Ticks.
- tuberculin-reacting, skin lesion in, 315, 455.

Cauliflower—
- *California*, composition and time for cooking, 770.
- cultivation for seeds, 131.
- fertilizer experiments, Ill. 36.
- soil acidity studies, N.Y.Cornell 15.

Caustic vine, poisonous to livestock, 597.

Cecidiology, handbook, 437.

Cedar rust, control, 551.

Cedar rusts on apple, Ind. 536.

Celeriac leaves, iron in, U.S.D.A. 85.

Celerio lineata larvae, toxicity studies by hypodermic injection, 584.

Celery—
- bacterial leaf spot and early blight, notes, Fla. 536.
- breeding, Calif. 525.
- California, composition and time for cooking, 770.
- culture, Va.Truck 674.
- fertilizer experiments, Ohio 35.
- protection from tarnished plant bug injury, 709.
- raw, vitamins in, 86.

Cellulose—
- determination in plant materials, 206.
- relation to lignin in wood, 646.

Celosterna scabrator, life history and control, 438.

Cement, Portland, action of sulfates on, 753.

Centipede, garden, control, Calif. 559.

Cephaleuros virescens, notes, 47.

Cephalonomia quadridentata, morphology and ecology, 443.

Cephalosporium and ascospore stage, 694.

Cephalothecium roseum, studies, 274.

Cephus pygmaeus, *see* Sawfly, wheat stem.

Ceratitis capitata, *see* Fruit fly, Mediterranean.

Ceratomia catalpae, *see* Catalpa sphinx.

Ceratophyllus fasciatus, *see* Rat flea.

Ceratostomella and Graphium, relationship, 704.

Ceratostomella—
- *cana* as variety of *C. piceae*, 539.
- *piceae cana* n.v., notes, 539.
- *pini*, comparison with other species, 539.

Cercospora—
- *personata*, notes, 696.
- spp. on clovers and alfalfa, synonymy, 402.
- spp., studies, 42.

Cercosporella carygena, notes, 147.

Cereal—
- anthracnose, Ind. 536.
- browning root rot, 189.
- crops, relative feeding values, Ohio 80.

Cereal—Continued.
- diseases, descriptions, Mich. 542.
- foot rot, 542.
- leaf rusts, Ind. 536.
- mixture, special, value in children's diet, 484.
- porridge, cooking, 337.
- *root rot, forms and control*, 409.
- rust—*see also* Rusts *and specific hosts*.
  - infection, relation to carbon dioxide in air, 691.
- rusts, cytological studies, Calif. 535.
- scab, Ind. 536.
- scab development, progress report, 691.
- seed treatment, *see* Seed treatment.
- seeds, broken, 522.
- smuts, control in Great Britain, 541.

Cereals—*see also* Grain *and specific grains*.
- in Lena Valley, weeds in, 384.
- structure and composition, 472.
- Thysanoptera attacking, 284.
- vitamin B (B_1) in, 186.

Ceresa bubalus, *see* Buffalo treehoppers.

Ceriman, propagation, Hawaii 385.

Certified Milk Producers' Association of America, proceedings, 165.

Chabertia ovina, notes, 601.

Chaetomella raphigera—
- asexual fructifications, 702.
- n.sp., description, 702.

Chaetostricha new species, description, 448.

Chagas' disease in Panama, 431.

Chalk in calcareous soils, rôle, 18.

Chamiza, growth and germination, N.Mex. 29.

Charcoal gas, use in tractors, 609.

Chard, iron in, U.S.D.A. 85.

Cheese—
- adjustment to changes in outside air temperatures, 164.
- American Cheddar, in diets, calcium retention on, 625.
- calcium in, 625.
- Cheddar, rancid flavor in, 163.
- cottage, effect of sunlight, Calif. 598.
- cottage, manufacture, Mo. 448.
- factories, starter preparation for, Oreg. 736.
- Gorgonzola-type, manufacture, Calif. 598.
- processed, body and texture, 736.
- processed, effect of acidity, Wis. 731.

Chelonus annulipes, biology and morphology, U.S.D.A. 582.

Chemical structure and optical rotation, 198.

Chemistry—
- agricultural, bibliography, 12.
- agricultural, textbook, 195.
- and chemical technology, bibliography of bibliographies, 645.
- bacteriological, work in, Iowa 856; Wis. 645.
- capillary, treatise, 195.
- physical, textbook, 356.

Chemistry—Continued.
 physiological, growth in America, 769.
 systematic organic, textbook, 195.
Chenopodium—
 oil, anthelmintic value, S.Dak. 69.
 varieties, growth, distillation, and physical constants, S.Dak. 69.
Cherries—
 arsenical spray residue problem, Oreg. 681.
 cracking, physiological studies, Idaho 257.
 fruitfulness in, 135.
 heat requirements, 256.
 mazzard and mahaleb roots, distinguishing, 256.
 new type of pressure tester for, 392.
 outlook, Utah 681.
 pollination, 249, 257, 681; N.Y.State 677.
 propagation, 256.
 sour, fruit set, Wis. 674.
 sour, insect pests, 425.
 spray schedule for, N.J. 38.
 sterility in, 39.
 variety tests, N.Mex. 135.
Cherry—
 case bearer, control, 53; Mich. 54.
 diseases, epidemic in Illinois, 410.
 fruit, weight, effect of sprays, 554.
 tree sour sap, cause, 700.
 trees, transplanting experiments, 256.
Chestnut—
 blight, notes, Conn.State 535.
 blight-killed timber, decay and organisms on, 703.
 large leaf spot, studies, 418.
Chick embryo—
 effect of X-rays on, 28.
 growth and mortality, effect of composition of air, 63.
Chickens—see also Chicks, Fowls, Hens, Poultry, and Pullets.
 hosts to *Prosthogonimus* spp., 585.
 White Leghorn, surface area, 63.
Chicks—
 antirachitic factor in, fate of, 62.
 ataxia associated with nephritis, 748.
 Barred Plymouth Rock, feather development, N.J. 729.
 brooder temperatures, N.H. 592.
 brooding, use of electric current in, Ind. 605.
 calcium-phosphorus requirements, Tex. 728.
 effect of adding yeast to rations, 729.
 growing, calcium-phosphorus ratio of tibiae, 63.
 growth of skeleton and internal organs, effect of vitamin D deficiency, 729.
 leg disorders, effect of feed, Tex. 728.
 leg weakness, effect of rice bran feeding, 729.
 livability, effect of pullorum disease in hens, 318.
 mortality and sex ratio in, 128.
 nutritive requirements, Nebr. 589.
Chicks—Continued.
 on vitamin A-deficient rations, uric acid in blood, N.J. 587.
 protein requirements, 62.
 rations for, Mo. 445.
 respiratory disease, Ohio 69.
 slipped tendon, preventives, Iowa 444.
 so-called "crazy," Mass. 457.
Chiggers, hosts for, 49.
Children—see also Boys and Infants.
 calcium in blood, distribution, 184.
 Chinese American, dietary study, 622.
 diabetic, basal metabolism, 487.
 diet, with increased vitamin B (B_1) and iron supply, value, 484.
 in day nurseries, midday meals for, U.S.D.A. 184.
 preschool, effect of ultra-violet irradiation, 780.
 school, of Texas, adequacy of diet, Tex. 770.
 school, of Texas, growth in height and weight, Tex. 771.
 teeth decay in, effect of diet, 341.
Chili pepper—see also Peppers.
 anthracnose, notes, 44.
 wilt, effect of irrigation, N.Mex. 43.
Chilo—
 infuscatella, notes, 562.
 simplex, studies, 286, 435.
Chinch bug—
 control, Mo. 424.
 false, notes, N.Mex. 50.
 relation to climate and weather, 431.
Chionaspis furfura, see Scurfy scales.
Chives, iron in, U.S.D.A. 85.
Chlorates—
 for Johnson grass control, N.Mex. 29.
 for weed control, Ohio 29, 30; Wis. 669.
 for weed control, improving efficiency, Idaho 243.
Chloride in milk, effect of unequal intervals between milkings, 733.
Chloridea obsoleta, see Bollworm and Corn ear worm.
Chlorine gas for disinfection of wells, 331.
Chlorophyll—
 and iron in plant tissues, relation, U.S.D.A. 86.
 characters in sorghum, inheritance, Tex. 515.
 deficiencies induced in cotton by radiations, Tex. 638.
 deficiency in new world cottons, inheritance, 227.
 formation in plants, effect of phosphorus content, 116.
 in plants exposed to ultra-violet rays, formation, 20.
 variations in mulberry leaf, 661.
Chlorops taeniopus—
 bionomics, 716.
 on wheat varieties, 284.
Chlorosis in plants, control, 539; N.Mex. 43.

Chlumetia transversa on mango in Philippines, 707.
Choanotaenia infundibulum, notes, 746.
Chokecherry pollinated with other species of Prunus, breeding, N.Dak. 673.
Cholesterol—
 determination, modifications of Okey's method, 206, 207.
 floridin activation, nature, Iowa 473.
Chromon repentinus, notes, 288.
Chromosomes—
 in grass sorghums, 374.
 in turkeys, studies, 24.
 number and morphology in Nicotiana, 224.
 number in *Althaea rosea*, 225.
 number in crown gall and cancer tissues, 513.
 number in peanuts, 24.
 number in phlox, 374.
Chrysanthemums, breeding, Iowa, 385.
Chrysomphalus aurantii, *see* Red scale, California.
Chrysomphalus ficus, biology in Egypt, 289.
Chrysomyia spp. on sheep in Queensland, 154.
Chrysomyza demandata, breeding in corn silage, 291.
Chrysopa ramburi, description and biology, Calif. 432.
Chrysopidae, Japanese, studies, 286.
Churns—
 as source of molds in butter, 68.
 sanitation, 68.
Cicadula sexnotata, *see* Leafhopper, six-spotted.
Cider, clarification results, Mich. 10.
Cigar case bearer, new in Utah, 427.
Cigarette beetle, *see* Tobacco beetle.
Cinara apini villosa n.v., description, 53.
Cirrhosis of the liver of equines, 596.
Citric acid—
 fermentation of *Aspergillus niger*, effect of iron, 645.
 titration in presence of ferric and cupric salts, 203.
Citripestis sagittiferella, life history and habits, 153.
Citrobacter freundii n.comb., 662.
Citrobacter, new genus, proposed, 661.
Citrus—*see also* Lemons, Oranges, *etc.*
 and Mangifera, apogamy in, importance, 532.
 aphid, green, notes, Fla. 559.
 aphids, control, 559.
 blast and allied organisms, 278.
 bug, larger horned, life history, 288.
 canker on lime twigs and fruits, 264.
 canker, studies, Fla. 535.
 coloring, recent developments, 532.
 die-back, relation to soils of western India, 277.
 die-back, studies, Fla. 535.
 diseases in Belgian Congo, 47.
 diseases, studies, Calif. 535.
 effect of selection within apogamic and clonal progenies, 531.
Citrus—Continued.
 exanthema in New South Wales, 416.
 Experiment Station, research, Calif. 525.
 flowering habit and fruit bud formation, 395.
 fruit borers, life history and habits, 153.
 fruit grades, improvement, 559.
 fruit juices, quick-freezing, 622.
 fruits—
  breeding, Tex. 673.
  canned, vitamin C in, Mass. 473.
  composition, Fla. 619.
  culture experiments, Miss. 35.
  decay in transit, 555.
  effect of mixed inoculations of fruit-rotting organisms, 277.
  effect of potash, 396.
  irrigation requirements and methods, Calif. 605.
  pruning, Miss. 35.
  storage experiments, Tex. 396.
  use for vinegar making, Fla. 619.
  variety tests, Miss. 35; Tex. 673.
 growth and reproduction, relation to nitrogen absorption and storage, Fla. 523.
 gumming disease, Fla. 535.
 gummosis and scaly bark, control, Tex. 690.
 insects, control, Tex. 706.
 leaves, relative transpiration rates, 684.
 malta disease caused by Verticillium tubercularioides, 46.
 mottle leaf, nutritional aspects, Calif. 278.
 nonhybrid tetraploid forms, tree and fruit characters, Calif. 512.
 progeny and bud selection, propagation, and variety tests, Fla. 523.
 propagation in Brazil, 137.
 roots, growth in different soils, P.R. 525.
 rootstocks, tests, Fla. 523; Tex. 673; V.I. 525.
 scab, control, Fla. 535.
 seedling form in, 40.
 seeds, germination, Fla. 523.
 species and varieties, apogamy in, Calif. 512.
 stem-end rot and melanose, Fla. 535.
 white fly, *see* White fly, citrus.
 withertip in Punjab, 46.
Citrus tachibana discovery in Formosa, significance, 395.
Cladosporium—
 carpophilum, notes, 410.
 epiphyllum on *Ficus magnolioides*, 703.
Cladosporium—
 diseases of stone fruits, 276.
 leaf spot of tomatoes in greenhouses, 551.
Climate—*see also* Meteorology.
 and insects, N.J. 560.
 and potato canker, 548.

Climate—Continued.
effect on man, 211.
of New Zealand, 655.
Climatic conditions at Sacaton, Ariz., U.S.D.A. 11.
Climatological—
data, *see* Meteorological observations.
observing stations in upper Congo-Nile region, 107.
Climatology of Australia, 655.
Clostridium—
acetobutylicum, fermentation by, 5.
botulinum, type C, notes, 322.
chauvei, notes, 740.
pasteurianum, nitrogen fixation and sugar utilization by, 118.
Clothes moth, webbing—
length of adult life, 54.
predator of tick larvae, 284.
Clothes moths, immature stages, fumigation, 566.
Clothing—
and textiles, textbook, 349.
class, ninth-grade, instruction in, 768.
Clover—
failure in Kentucky, cause, Ky. 141.
red—
and alfalfa, protein in, comparison, 32.
culture experiments, Ohio 517.
improvement, N.J. 517.
monograph, 669.
powdery mildew, Ind. 536.
seed, imported, field tests, U.S.D.A. 127.
varieties and strains, N.J. 123.
variety tests, Iowa 378; Mass. 378; Ohio 517; W.Va. 666.
seed production, effect of bees, Mich. 384.
sour, breeding, Calif. 516.
time of cutting, Ohio 29.
v. sweetclover, comparison, Ohio, 30.
variety tests, N.J. 517.
Clubroot of crucifers, 545.
Cluster fly, first instar larvae, feeding habits, 437.
Clysia ambiguella epidemiology, 285.
Coal, anthracite, utilization for domestic heating, 191.
Cobb, N. A., necrology notes, 352.
Coccaceae studies, N.Y.State 224.
Coccidia—
infections, allergy and immunity, 310.
size as species characteristic, 422.
Coccidiosis—
avian, studies, Ohio 69.
control, 320.
effect on weight of chicks, 458.
experimental, development, effect of diet, 320.
in birds, 452.
in chickens, effect of rations, 461.
in fowls, 319, 457; La. 318; N.J. 74; R.I. 318.
research, criteria and methods in, 457.
Coccids, protection against, 285.
Coccoidea on wild plants in semiarid regions, 432.
Coccomyces sp., notes, 410.
Coccophagus gurneyi, description and biology, Calif. 432.
Coccus viridis, notes, 711.
Coccus viridis on coffee, 151.
Cochineal insect for control of pricklypear, 289.
Cockchafer, grayback, grub parasite of, 442.
Cocklebur control by insects, 576.
Cockroach—
American, control, N.J. 561.
German, intermediate host of *Tetrameres americana of poultry*, 288.
Cocoa, stabilizing in chocolate milk, N.J. 594.
Coconut—
black beetle, habits and control, 155.
diseases, notes, 400.
leaf miner, effect on production of coconut trees, 154.
leaf miner, fungus disease of, 435.
leaf miner, unusual outbreak in Philippines, 435.
meal as protein supplements, Ohio, 65.
palm diseases, rôle of lightning in, 400.
palm wilt in Trinidad, 47.
palms, fertilizer experiments, variation in productivity, P.R. 532.
palms, salt requirements of seedlings, 40.
spike moth, importance and control, 438.
Coconuts, green, ripe, and sport, nutritive value, 337.
Codling moth—
abundance, Mo. 424.
activity and insecticide tests for, 572.
arsenical substitutes for, N.J. 560.
attrahent baits for, N.Mex. 50.
behavior, effect of artificial light, Calif. 559.
biology, spraying, and banding, Ohio 50.
control, 54, 283, 291, 424, 713; Ind. 560; Mich. 484; Mo. 424.
chemically treated bands for, 561.
cost, 425.
in Delaware, 423.
in high veld of South Africa, 713.
in Victoria, 484.
in Virginia, 424.
lead arsenate v. summer oils, 425.
new developments, 561.
results of community action in, 283.
schedule for 1932, 425.
self working bands for, 425.
tests of insecticides, U.S.D.A. 152.
experiments in New South Wales, 153.
field experiments, small plots in, 54.
flight, distance and direction, 713.
importance, 705.
improved oviposition cage for, 50.

Codling moth—Continued.
in Maryland, 560, 565.
infestation, avoiding, 560.
life history studies, Idaho 290.
on apples, N.Y.State 150.
orchard spraying for, Nebr. 572.
overwintering stage, tests against, 713.
parasite of, N.Y.State 442.
poisons, comparison, 713.
problem, analysis, 425.
sprays, efficiency test, 54.
sprays, timing, emergence cages and bait pails for, Pa. 483.
Cod-liver—
meal, vitamin value, 158.
oil—
acid content as index to value. Wis. 723.
effect on winter egg production, Minn. 730.
value for pigs, La. 295.
vitamin A determination. 200.
oils, antimony trichloride and ultraviolet absorption tests, 102.
Coffee—
bean disease, 417.
beans, parasitic disease, 702.
berry borer in Java, 156.
culture, Hawaii 385.
fertilizer experiments, P.R. 525.
flower abortion in Kenya, cause, 431.
green scale, summary, 151.
in Trinidad, American leaf disease on, control, 47.
insects affecting, 426.
leaf disease, seasonal periodicity, 146.
thread blight, notes, 400.
Cold waves in Utah, characteristics, 107.
Coleophora—
fletcherella, see Cigar case bearer.
pruniella, control, 53; Mich. 54.
Coleoptera—
from a sheep pasture, 427.
larval forms, synopsis, 57.
of India, immature stages, 580.
Coleosporium solidaginis on pine, 704.
Colic in horses and mules, control, 169.
Collards, iron in, U.S.D.A. 65.
Colleges, *see* Agricultural colleges.
Colletotrichum—
gloeosporioides, notes, 46, 47, 279.
lagenarium, biology and control, Iowa 399.
nigrum on chili, 44.
phomoides, effect of radiant energy, 409.
Colloidal—
behavior of soils, laws, 219.
material in Missouri soil, properties, Mo. 367.
Colloids—
dispersable organic, in peats, characteristics, 112.
iron and aluminum, in soils, N.J. 505.
soil, base-exchange reactions, equilibria, 14.
soil, mineral constituents, 655.
Collyria calcitrator—
colonization in Canada, 157.
notes, 157.
Color—
inheritance in eggplants, 525.
inheritance in Indian corn, 24.
inheritance in plumage of pigeons, 231.
inheritance in swine, Mo. 376.
inheritance of millet kernels, 25.
of Rhode Island Reds, genetic study, Mass. 446.
Colorado Station, notes, 639.
Colts, draft—
growth studies, Mo. 445.
preparation of feeds, Iowa 444.
Columbine, unlike reciprocal hybrids in, 513.
Combines—
and small threshers, cost of harvesting with, Ind. 612.
for harvesting peas, 327.
use, S.Dak. 76.
Composts—
making and value, U.S.D.A. 19.
uronic acid complexes in, 16.
Concrete—
arches, reinforced, laboratory tests, 77.
placed in deep forms, segregation of water in, U.S.D.A. 808.
Portland cement, effect of calcium chloride in, 464.
preparation and use in small structures, 753.
resistance to frost action, U.S.D.A. 468.
Coniferous—
nursery stock in Scotland, brown chafer control in, 293.
seed beds, steam sterilization, 280.
seedlings, transpiration capacity and heat injury, 686.
Conifers—
and hardwoods, mixed stands, rabbit injury in, N.H. 533.
chewing insects infesting, Mich. 566.
fungus disease, relation to snow cover, 557.
tests, Nebr. 524.
Coniophora cerebella, oxidases in, 49.
Coniothyrium fuckelii, notes, Mich. 46.
Coniothyrium zeae, notes, 694.
Connecticut State Station, report, 637.
Conopholis americana on oak roots, 557.
Conotrachelus nenuphar, *see* Plum curculio.
Contarinia onobrychidis in Wiltshire, 284.
Contarinia pyrivora, *see* Pear midge.
Cooking with heat generated by resistance of food to electric current, 637; Iowa 493.
Cooperative—
associations, farmers', in Florida, Fla. 619.
movement in India, 767.
Cooperatives, financial structures, 385.
Cooperia oncophora in calves, 317.
Copper—
absorption by plants, Calif. 500.
administration with oyster diet, 91.

Copper—Continued.
and iron for anemic infants, 465.
and mercury, specific action as plant poisons, 540.
atmospheric corrosion, 464.
carbonate as Natal fruit fly poison, 427.
carbonate dusts for bunt prevention, 404.
in animal nutrition, function, 340.
in dairy products, 653.
in plants, relation to additions to soil, 776.
necessity as iron supplement for hemoglobin formation in pigs, 348.
rôle in hemoglobin regeneration and in reproduction, 87.
solubility in milk, 67.
sprays v. copper dusts for grape diseases, 701.
Coprophagy, effect on rats deprived of vitamin B complex, 632.
Corethra plumicornis, effect of Dalmatian insect powder, 285.
Corn—
adaptation to upland and bottom land soils, 127.
amino acid deficiencies, for growth in rats, 627.
and grain sorghums, comparison, Tex. 668.
and soybean rations, effect of yeast and casein supplements, 295.
and soybeans, intercropping, La. 233.
and soybeans, production with mechanical power, La. 322.
bacterial disease, 544.
binder and silage cutter combined, Can. 467.
borer, European—
Beauveria spp. affecting, 290.
breeding corn resistant to, Mich. 33.
control, Ind. 560.
control, draft of plows used for, U.S.D.A. 755.
control, problems in, 234.
in Baden in 1928, 426.
in Japan, 286.
in western New York, N.Y.State 153.
increase, Conn.State 559.
infestation, effect on farm organization, U.S.D.A. 180.
notes, N.H. 560.
parasite, biology and morphology, U.S.D.A. 582.
research in 1931, Ohio, 50.
seasonal history in Indiana, 55.
status in United States in 1931, 713.
breeding, Fla. 516; Iowa 378; La. 233; Mo. 378; N.Dak. 667; Nebr. 517; P.R. 517; Tex. 668; U.S.D.A. 28; Wis. 669.
breeding for borer resistance, Mich. 33.
Corn—Continued.
carbohydrate variations in, S.Dak. 30.
cold resistance and susceptibility in, 508.
colored scutellums in, inheritance, U.S.D.A. 515.
continuous growing with legume and nonlegume green manure, N.J. 507.
cost of production, Iowa 470; La. 181.
costs and utilization, Iowa 760, 761.
costs in 1930 of husking and cribbing, Ind. 613.
cover and green manure crops, comparison, N.J. 517.
crosses, relative yield before and after selection, 24.
crosses, studies, Tex. 513.
cultivation methods, Ohio 29.
culture experiments, Fla. 516; La. 123, 233; N.Dak. 667; Ohio 517; Tex. 668.
development, effect of fertilizers and planting date, 32.
dioecious, derivation, Conn.State 516.
disease resistance, measuring, Wis. 690.
diseases, Fla. 536; Ind. 536.
double strand crossing over in, 513.
drying in crib, Ind. 605.
ear worm as greenhouse pest, Mich. 54.
ear worm, attraction to spray baits, 504.
ear worm, control, Calif. 559; Fla. 559.
ear worm, hibernation in Maryland, 558.
ear worm infestation, relation to time of silking, 715.
effect of summer fallowing, Wis. 657.
experiments, Ind. 517.
feeding to pigs, preparation and method, Ohio 592.
fertility tests for, Ohio 30.
fertilizer experiments, Fla. 516; La. 28, 123, 233; Md. 517; Miss. 29; Nebr. 517; Ohio 30; Tex. 668; Va. 668.
fertilizer placement studies, N.H. 517; Ohio 517.
fertilizer, quantity in hill, Ohio 29.
fertilizers, method of applying, Mass. 378.
field, iodine test for, 208.
for grain and silage, variety tests, Md. 517.
for hogs, fineness of grinding, Wis. 723.
for silage, variety tests, Conn.State 516.
fumigation, La. 283.
Fusarium disease, control, 406.
genes with pollen sterility characters, 514.
genetic and cytological relationships, Tex. 668.
genetic studies, Iowa 378; Mo. 225, 378.
gluten meal as nitrogen source, Conn. State 516.

Corn—Continued.
ground yellow, v. cottonseed cake for range cattle, N.Mex. 445.
harvesting, Ohio 517.
harvesting machinery, development, S.Dak. 76.
heterofertilization in, 226.
hogging down, tankage and alfalfa as supplement, Mont. 300.
hogging down v. dry lot feeding of pigs, La. 295.
improvement, N.J. 517; Ohio 30.
inheritance studies, 119; Tex. 668.
insects affecting, 426.
kernels for seed, large v. small, Conn. State 516.
land, poor, wheat v. corn on, Ohio 30.
leaf aphid, notes, 142.
leaf aphid, vector of onion yellow dwarf, 432.
leaves, change of substances in during vegetation, 372.
Mendelian ratios in, modification, 225.
mutations in, heat-induced chlorophyll, 226.
new gene affecting production of anthocyanin pigment, 515.
new pest in Dutch East Indies, 435.
of State, destination and origin, Iowa 470.
Penicillium injury to, 694.
plants, unidentified injury, Tex. 690.
pollination, hand v. wind, for first crosses, 238.
price differentials, Iowa 470.
prices, factors affecting, Minn. 617.
production, machinery for, Iowa 462.
production, plow coverage and picker losses, Ind. 605.
proteins in, effect of nitrogen fertilization, N.J. 594.
quality, effect of fertilizers, Ohio 29.
residue, effcet on crop yields, 31.
root system on different soil types, N.J. 517.
rootworm, effect of rotation, 577.
rotation experiments, Nebr. 517.
seed, induction of mutations by heating, Fla. 516.
seed, smooth v. rough kernels, La. 28.
seed treatment, Iowa 399; La. 233.
seed, vitality, effect of moisture and freezing, N.Dak. 667.
seedling blight, predisposition to, factors affecting, 541.
seedling blight resistance, inheritance, 544.
seedlings, *Fusarium moniliforme* on, pathogenicity and variability, W.Va. 189.
semisterility in, studies, 226.
silage, *see* Silage.
smut, pathogenicity, 267.
smut resistant strains, Iowa 399.
spot prices, 1879–1930, U.S.D.A. 85.
Stewart's wilt disease, Wis. 690.
stored, insect pests, control, Fla. 559.

Corn—Continued.
stover, productive value, Tex. 728.
strains, drought resistance, Ohio 29.
supplements for dry lot feeding, Ohio 591.
sweet, *see* Sweet corn.
tissues, glucose and fructose in, 208; Ohio 29.
v. rice for fattening hogs, Mo. 445.
v. sorghum for grain and forage, Mo. 378.
v. sorghum for grain and silage, Miss. 29.
v. wheat for milk production, Ohio 65.
varieties and hybrids, tests, Ohio 29.
varieties and strains, N.J. 123.
varieties for grain, fodder, and silage, N.J. 127.
variety tests, Iowa 378; La. 28, 123, 233; Miss. 28, 29; Mo. 378; N.Dak. 667; N.Mex. 29; Nebr. 517; Ohio 30, 517; Tex. 668; U.S.D.A. 28; Wis. 669; Wyo. 30.
vivipary in, 225.
white sheath in, inheritance, 663.
yellow, exposure to air, vitamin A in, Ind. 589.
yield and cost per acre, Md. 613.
yields, effect of drought, Ohio 30.
yields, effects of previous hay crop and soil reaction, Ohio, 29.
yields, effects of Sudan grass in rotation, Iowa 378.
Corncobs, distillation and use of products, 329.
Cornell University, notes, 192, 640.
Cornstalk—
beetle, rough-headed, rearing, 578.
borers, notes, Iowa 424.
shavers, sled-type, construction, U.S.D.A. 177.
Cornstalks, fungi on, Iowa, 399.
Coronilla spp., carpological peculiarities, 384.
Corpora lutea, functions, 121.
Corticium—
solani infection, factors affecting, 587.
vagum, notes, U.S.D.A. 44.
Corynebacterium—
equi in pneumonia in foals, 169.
ovis, notes, 316, 600.
Corythucha gossypii in Puerto Rico, 289.
Cost of production—*see also specific crops.*
and farm income, Ala. 759.
reducing by machinery, 234.
Cotton—
angular leaf spot resistance, effect of sodium chloride, 269.
angular leaf spot, studies, 586, 587.
aphid, biologic control, 694.
as principal cash crop in Texas, U.S.D.A. 30.
asexual propagation, Tex. 668.
boll weevil, *see* Boll weevil.
bollworm, *see* Bollworm.
breeding, Fla. 516; La. 233; Tex. 668.

Cotton—Continued.
breeding and genetic studies, N.Mex. 29.
chlorophyll deficiencies induced by radiations, Tex. 638.
Committee, Indian Central, report, 238.
cost of production, La. 181; Miss. 761.
cultural methods and winter cover crops for, La. 28.
culture experiments, Fla. 516; La. 123, 233; Tex. 668.
cytology and genetics, 227.
disease research, U.S.D.A. 44.
effect of irradiation, Tex. 668.
effect of irregular fertilizer distribution, 519.
fabrics, durability and color, effect of Texas sunlight, Tex. 781.
fabrics, durability, effect of laundering, Mo. 493.
farms in High Plains, organization and management, Tex. 757.
fertilizer experiments, Fla. 516; La. 28, 123; Miss. 29; Mo. 378; N.Mex. 29; Tex. 668; Va. 668.
flea hopper, feeding punctures and effect on cotton, U.S.D.A. 288.
flea hopper, hibernation, Tex. 705.
fruiting, factors affecting, Ark. 669.
grafting experiments, Tex. 509.
growing possibilities in St. Croix, V.I. 518.
harvesting, Tex. 750.
harvesting, storage, and ginning experiments, Tex. 668.
hybrids, intergeneric, studies, 228.
improvement by type selection, U.S.D.A. 127.
improvement in Russia, 234.
in Armenia, response to fertilizers, 18.
Indian, inheritance of corolla color in, 24.
inheritance of lint percentage in, 24, 25.
inheritance of seed weight and lint index related to hereditability of lint percentage, 25.
inheritance studies, Tex. 668.
insects affecting, U.S.D.A. 706.
irrigation, Calif. 605.
irrigation and related cultural practices, U.S.D.A. 128.
land, subsoiling, La. 322.
lint characters, correlations and application, 519.
new world, chlorophyll deficiency, inheritance, 227.
outlook for 1932, U.S.D.A. 84.
pests, 286.
Pima, susceptibility to angular leaf spot, effect of sodium chloride, 269.
planting and spacing tests, U.S.D.A. 30.
pollen antagonism in, 227.
prices and marginal land, 469.
production in Salt River Valley, U.S.D.A. 28.

Cotton—Continued.
Punjab-American, effect of climate, 238.
research in British Empire, 33.
research with, U.S.D.A. 28.
root development, La. 233.
root knot, studies, U.S.D.A. 44.
root nematode disease, treatment, 406.
root rot conference, report, Tex. 546.
root rot, effect of flooding, Tex. 546.
root rot, leaf temperatures in, 406.
root rot, studies, Tex. 690; U.S.D.A. 44.
root rot, Texas, in Arizona, 265.
root rot, treatment with ammonia, 141.
roots, acid injury, Tex. 545.
roots, strangulation, Tex. 546.
seed, see Cottonseed.
sore shin in Egypt, 407.
sore shin, studies, U.S.D.A. 44.
spacing, seeding date and topping, N.Mex. 380.
stand, effect of machine method, 610.
stem cuttings, callusing, Tex. 509.
stem rot of young plants, Tex. 546.
Upland, shedding of 4-lock and 5-lock bolls, U.S.D.A. 33.
variety tests, Fla. 516; Ga. 127; La. 28, 123, 233; Miss. 28, 29; Mo. 378; N.Mex. 29; Tex. 668; U.S.D.A. 28, 30; Va. 668.
water requirements and economical use of water, N.Mex. 76.
wilt and yield, effect of preceding cover crops, Miss. 29.
wilt carriers, Tex. 690.
wilt disease, description, U.S.D.A. 44.
wilt due to *Verticillium alboatrum*, 547.
wilt, effect of fertilizers, Ark. 547.
wilt in India, 269.
wilt, notes, 265.
wilt, seed transmission, 694.

Cottonseed—
and fertilizer distribution and placement, Tex. 750.
cake v. ground yellow corn for range cattle, N.Mex. 445.
feeding value, La. 782.
germination at low temperatures, 380.
hulls, feeding value, N.Mex. 298; Tex. 731.
meal and hulls for lactating dairy cows, Tex. 731.
meal as protein supplements, Calif. 588.
meal, feeding value, La. 295; N.Mex. 298; Ohio 591.
meal for pigs, autoclaving, Ohio 58.
meal, nutritive value for growing chicks, N.Mex. 62.
meal, productive value, Tex. 723.
meal v. fish meal and kelp, feeding value, Ohio 65.
oil, ingested, effect on composition of body fat, 61.
treatment, La. 233.

Cottony cushion scale—
in Puerto Rico, 705.
notes, 285, 428.
Country, *see* Rural.
County receipts and expenditures, Va. 82
Cover crops—
for cotton and corn, La. 123.
in citrus groves, Fla. 523.
winter, for corn, Miss. 29.
winter, for cotton, La. 28.
winter, variety tests, Fla. 516.
Cowpeas—
as hay crop, N.J. 379; U.S.D.A. 30.
breeding, Calif. 516.
culture experiments, N.Mex. 29.
for seed, U.S.D.A. 30.
iron in, U.S.D.A. 85.
variety-date-of-planting tests, Fla. 516.
variety tests, N.Mex. 29; Tex. 668.
Cows—*see also* Calves, Cattle, *and* Heifers.
calcium and phosphorus metabolism, 731, 732.
fat, carcass studies, Mo. 445.
feeding, 731.
fly sprays for, 576.
Holstein-Friesian, gestation period, 123.
lactating and nonlactating, plasma lipids in, 304.
lactating, ration for, Tex. 731.
milk production, *see* Milk production.
shelters for, N.Dak. 731.
udders, *see* Udder.
Von Lochod herd, inheritance of milk and fat production, 119.
Crab apple seedling, notes, S.Dak. 36.
Crambus hortuellus, *see* Cranberry girdler.
Crambus spp., *control*, 435.
Cranberries—
and cranberry products, utilization studies, Mass. 473.
fertilizer experiments, N.J. 524.
insects affecting, Mass. 428.
nutrient requirements and histology, 40.
photosynthetic studies, Mass. 385.
variety tests, Mass. 385.
Cranberry—
fruit worm, notes, Mass. 428.
girdler, notes, Mass. 428.
plant and associated mycorrhiza, N.J. 524.
Crapemyrtle, pollination experiments, Tex. 673.
Crawfish meal, feeding value, 589.
Cream—
acidity in, effect on fat losses in buttermilk, Iowa 447.
deodorization for butter manufacture, Mo. 448.
fast frozen, 162.
fat clumping, relation to feathering and heat stability, 161.
frozen, sugar for improving keeping quality, Wis. 731.
in storage, effect of minerals and acidity, Wis. 731.
Cream—Continued.
neutralizing, for butter making, N.Dak. 731.
separators, efficiencies, new testing *process*, 177.
serum separation in, prevention, Mo. 448.
single and double homogenization, effect on coagulation, 161.
sour, pimples in, cause, N.J. 594.
sweetened, frozen, effect on swell in ice cream, 309.
whipping ability, effect of milk salts, Wis. 731.
Creameries, starter preparation for, Oreg. 736.
Creamery, cooperative, essentials in, S.Dak. 181.
Creatine and creatinine, 769.
Creatinine and creatine, 769.
Creeping Jennie, spread and eradication, Iowa 378.
Cremastus cookii, notes, 571.
Cremastus interruptor, primary larvae, parasitic on European pine shoot moth, 290.
Creosote applied to gipsy moth egg clusters, brush for, U.S.D.A. 53.
Crepis dioscoridis, genetics, Calif. 512.
Crewood oil for control of mites in poultry houses, La. 313.
Cricket, *Haitian coffee tree, notes, 288.*
Cricket, snowy tree, in California fruits, 423.
Crickets, control, N.Dak. 705.
Cronartium—
comptoniae on pitch pines, U.S.D.A. 148.
ribicola, see White pine blister rust.
Crop—
mixtures, growing experiments, Mich. 31.
production—
at Big Spring, Tex., field station, U.S.D.A. 30.
in Red River Valley, Minn. 757.
on Newlands project, Nev. 471.
relation to run-off water *losses*, Tex. 668.
value of summer fallow, U.S.D.A. 124.
reports, U.S.D.A. 182, 610, 766.
rotations, *see* Rotation of crops.
yield estimates, adequacy and reliability, U.S.D.A. 766.
yields, effect of drought, Ohio 30.
yields, effect of fertilizers, moisture, and humus, 220.
yields, effect of *sorghum residues*, 31.
yields, relation to precipitation in Great Plains area, U.S.D.A. 666.
Crops—*see also* Field crops, Forage crops, *and specific crops.*
costs of production, percentages of land charges, Mo. 470.
of Florida, iodine in, Fla. 505.
protection against foreign pests, 566

Crops—Continued.
response to fertilizers and rotations, Ohio 517.
Crossing over in corn, double strand, 513.
Crotalaria—
bugs, notes, 559.
variety tests, Fla. 516; P.R. 517.
Crown gall—
and hairy root organisms, differentiation, 538.
organism, lytic principle, potency and specificity, 539.
Crown galls, chromosome numbers in, 513.
Crucifer club root, notes, Conn.State 535.
Cryolite as Natal fruit fly poison, 427.
Cryptococcus—
fagi, fate of beech trees infested by, 285.
fagi in New England, 50.
farciminosus, mycelial forms in epizootic lymphangitis, 743.
Cryptolaemus montrouzieri, notes, Fla. 559.
Cucumber—
beetle, spotted, migratory habit, 56.
beetle, spotted, notes, La. 283.
beetles, striped and spotted, studies, 717.
downy mildew, notes, Mass. 399.
mosaic, reaction of Chinese variety to, 547.
mosaic resistance, breeding for, 547.
powdery mildew, control in greenhouse, Ohio 43.
root knot, control, 273.
treatments, relative toxicity, Ohio 43.
varieties, sex expression, seasonal variation in, 247.
Cucumbers—
Chinese Long, immunity to white pickle mosaic virus, Iowa 399.
cost of production, N.J. 613.
culture experiments, La. 244.
fertilizer experiments, La. 130, 244.
hothouse, chlorosis of, 694.
parthenocarpy in, 675.
response to fertilizers, 36.
variety tests, La. 130.
Cucurbit downy mildew, Fla. 535.
Cucurbits, breeding, Iowa 385.
Culex quinquefasciatus, transportation by airplanes, 437
Culex spp., winter breeding and activity at New Orleans, 55.
Culture media—
effect of renewal of nutrient solutions on plant growth, 21.
for microorganisms, formulas, 873.
Culverts, cast iron pipe, under rock fills, loads on, 77.
Curculio and weather, 427.
Curculio, control, 560.
Currant—
black, seedling, notes, S.Dak. 36.
leaf spot, control, 414.
worm, biology, 441.
Currants, fertilizer experiments, 388; Ohio 36.
Cuscuta epilinum in Ural Region, 384.
Cutfoot Experimental Forest, notes, 95.
Cutworms—
control, *Fla.* 559.
increase in western Canada, 283.
Cyanide, effect on respiration of potatoes, 510.
Cyanides, method of action on cysteine oxidation, 196.
Cydia pomonella, *see* Codling moth.
Cylindrosporium caryigenum, notes, 147.
Cyllene robiniae, *see* Locust borer.
Cymatodera aethiops, *predator of codling moth*, N.Mex. 50.
Cypre *canker disease*, *control*, 48.
Cysteine, cobaltous, oxidation, 4.
Cysteine, spontaneous oxidation, 196.
Cystine—
dietary, relation to growth and cystine in hair of rat, 628.
limiting factor in nutritive value of alfalfa proteins, 723.
method of action on cysteine oxidation, 196.
Dahlias—
culture, *varieties*, and *breeding*, N.J. 397.
fertilizer experiments, Conn.State 528.
insects affecting, N.J. 561.
spraying and dusting experiments, 568.
Dairy—
barns, length and floor construction of stalls, Iowa 178.
cattle and dairy cows, *see* Cattle *and* Cows.
equipment, sterilization, Mich. 449.
farming, studies, N.H. 333.
farms, *profits on*, *N.J.* 82, 615.
herd test, *uniform rules for*, 66.
management methods and structures, trends in, 178.
marketing investigations, Ind. 594.
plants, *refrigeration in*, U.S.D.A. 178.
production studies, Mass. 447.
products, copper in, 653.
sires, *see* Bulls *and* Sires.
situation, survey, Wis. 757.
stable ventilation, electric, 330.
statistics, Wis. 757.
utensils, sterilization with dry heat, N.Y.State 735.
utensils, *sterilization with steam*, *Calif.* 605.
utensils, sterilizer, new electric, 611.
Dalmatian insect powder, toxicity, 285.
Dandelion greens, iron in, U.S.D.A. 85.
Dasheens, fertilizer experiments, P.R. 517.
Dasyneura pyri, new pest in Hudson Valley, 705.
Dasyscypha agassizii on *Pinus strobus*, 418.
Datana integerrima, *see* Walnut caterpillar.
Date—
diseases, studies, Calif. 565.
palm black scorch, notes, 147.
palm diseases, Calif. 146.
palm inspection, 428.
scale in Arizona, introduction, 428.

Dates—
chemical studies, Mass. 473.
culture, U.S.D.A. 35.
variety and propagation studies, Tex. 674.
Daucus carota seeds, studies, 522.
Davainea proglottina, notes, 746.
Day length—
effect on flowering behavior of hog peanut, 117.
effect on plants, 116.
Death camas as poisonous plant, Wyo. 70.
Deer flies of Adirondacks, 716.
Deer, helminth parasites of, 605.
Dehydration, *see* Drying.
Delphinium seeds, vitality, effect of storage, 533.
Department of Agriculture, see United States Department of Agriculture.
Dermacentor—
albipictus, parasite of moose and cattle in Nova Scotia, 450.
variabilis, see Dog tick.
Dermatitis—
contagious pustular, of sheep, 452.
in dogs, relation to *Rhabditis strongyloides*, 746.
Derris—
compound, Gussanol, effect on cattle grubs, Mich. 55.
insecticides from, digest of literature, U.S.D.A. 150.
Derrisol as Natal fruit fly poison, 427.
Desert soils, reclamation under irrigation, Nev. 462.
Desmometopa on hides, 438.
Dewberries, seed and berry size, 394.
Dextrose metabolism and nitrogen fixation, 118.
Diabetes, weighed high carbohydrate diets for, 92.
Diabetic diets, low costs, 349.
Diabrotica—
duodecimpunctata, see Cucumber beetle, spotted.
longicornis, see Corn rootworm.
vittata, see Cucumber beetle, striped.
Dialeurodes, new species of Formosa, 432.
Diaporthe sp. on American elm, 148.
Diarrhea—
bacillary white, *see Pullorum disease.*
infectious, of pigs treated with serum, 456.
Diatraea—
infuscatella, notes, 562.
saccharalis, see Sugarcane moth borer.
zeacolella, see Cornstalk borers.
Dibrachys boucheanus—
notes, N.Y.State 442.
parasite of codling moth, N.Mex. 50.
Dictyocaulus filaria in sheep, control, 601.
Didymella applanata, notes, 415, 690.
Diet—*see also* Food *and* Nutrition.
accessory factors, *see* Vitamins.
as index of standards of living in farm homes, Utah 781.
deficiency diseases, *see specific diseases.*
Diet—Continued.
low-protein, effect on weight of rats, 477.
neutral, directions for constructing, 478.
normal and deficient, body temperature in, 477.
of children, *see* Children.
of Federal prisoners, 474.
Dihammus cervinus, notes, 562.
Dinoderus minutus, notes, 150.
Diorymerellus laevimargo, notes, N.J. 561.
Dioscorea black spot disease, 143.
Diplodia dry rot, notes, Iowa 399.
Diplodia jasmini, notes, 47.
Diplodia spp., notes, Fla. 536.
Diplosis sp., description and biology, Calif. 432.
Diprion koreana n.sp., description, 157.
Diptera from a sheep pasture, 427.
Diptera of Utah, 425.
Disease—
cause and prevention, Utah 738.
resistance, effect of vitamin B, 778.
Diseases—
of animals, *see* Animal diseases *and specific diseases.*
of plants, *see* Plant diseases *and specific host plants.*
Disinfectant for seed grain, 541.
Disinfectants, soil, acetic acid and pyroligneous acid as, 540.
Distemper of dogs, studies, 456, 746.
Distemper-like disease of foxes, 171.
Ditches, drainage, *see* Drainage.
Dock mosaic, virus extract, properties, 265.
Dodonaca, spiked leaves, intracellular bodies in, 264.
Dog liver, carotenase in, 647.
Dog tick—
American, *Bacterium tularense* in, 72.
American, transmission of anaplasmosis by, 311, 597.
brown, rôle in transmission of exanthematous fever, 444.
brown, transmission of boutonneuse fever by, 741.
Dogs—
blood of, physical and chemical measurements, 628.
contagious disease caused by bi-polar organism, 596.
in Kenya, parasites of, 452.
sledge, epidemics among, relation to disease in arctic fox, 318.
vitamin B (B_1) requirement, 633.
Domestic science, *see* Home economics.
Dorylaimus regius, notes, 283.
Doughs, characteristic action of leavening agents in, 338.
Douglas fir—
decay and losses in, U.S.D.A. 280.
electric polarities in wood and cortex, effects of temperature, 687.
in Germany, danger from *Rhabdocline* sp., 557.
reproduction stands, sampling, 688.

Drainage—
channels, water flow in, 76.
ditches, weed control in, Ohio 75.
of land overlying an artesian basin, 323.
pumping, cost, 607.
studies in Everglades, Fla. 606.
Drosophila funebris, host of stigmatomyces, 284.
Drought—
and evaporation at Wooster, Ohio, 43.
damage to crops, underdrainage as protection against, 322.
effect on mineral content of pastures, 297.
resistance in plants, 508.
Drugs, administration in drinking water, for sheep parasites, 72.
Drug-store weevil parasite, morphology and ecology, 443.
Dry farming—
for high altitude, tillage methods, Idaho 234.
v. irrigation under the ditch, 322.
Drying machine, hot air, Ind. 605.
Duck sickness, western, studies, 322.
Ducklings, pasty eyes in, Mich. 75.
Ducks—
hosts to *Prosthogonimus* spp., 585.
parasitic in reproductive activities, 704.
sex-linked down character in, 26.
Dunsiekte of equines in South Africa, 70.
Dust explosions, carbonaceous, nature, cause, and prevention, treatise, 468.
Dust explosions, experiments, 468.
Dusting—*see also* Spraying *and specific crops.*
mechanical means of projecting air for, N.J. 605.
Dusts—
proprietary, for barley smut and wheat bunt, 541.
sticking qualities, effect of mineral oils in, 563.
Dutox, new barium fluosilicate insecticide, La. 283.
Dyes, visual spectrophotometry, U.S.D.A. 654.
Dyestuffs, formation of semiquinones as intermediary reduction products from, 197.
Dynamometer—
draft, for teams, 327.
new belt transmission, Ind. 605.
Dysentery, chronic bacterial, *see* Johne's disease.
Earias spp., notes, 280.
Earth, rammed, for farm buildings, S.Dak. 76.
East coast fever, *see* African coast fever.
Echidnophaga gallinacea, *see* Fleas, sticktight.
Ecological and climatological studies in upper Congo-Nile region, 107.
Economic—
information, use by farmer, U.S.D.A. 614.
research, relation to other research, 469.
Eczema in a Holstein cow, 596.
Edema, malignant—
and black quarter, 70.
in Brazil, 455.
Education, agricultural, *see* Agricultural education.
Egg—
albumin, *see* Albumin, egg.
prices, *relation to feed prices, Mo. 445.*
production—*see also* Hens, laying.
and hatchability, effect of cod-liver oil, Minn. 730.
annual, estimating, 302.
breeding for, Mass. 446.
feeding for, Iowa 444; N.Mex. 730.
hens v. *pullets for, Ohio 58.*
inheritance and improvement, Tex. 723.
relation to date of hatch and first egg, Iowa 444.
weight, average annual, estimating, 302.
yolk proteins, studies, 645.
Egg-laying contest in Michigan, records, Mich. 64.
Eggplant wilt, notes, Mass. 399.
Eggplants—
anatomical structure, 131.
California, composition and time for cooking, 770.
inheritance of color in, 525.
market diseases, identification, U.S. D.A. 405.
Eggs—
cooperative shipping, Ind. 589, 764.
cost of production, N.H. 613.
graded, buying in Iowa, Iowa 765.
hatchability, effect of pullorum disease in hens, 318.
hatchability, nutritional factors, Ohio 58.
hatching results, effect of heavy laying, La. 295.
incubation, *see* Incubation.
iodine in, Ohio 58.
January and June, vitamins in, Mo. 480.
preserved, vitamin D in, 490.
prices, factors affecting, Mass. 471.
production and hatchability, N.J. 587.
storage on farm, refrigeration for, 331.
storage studies, La. 295.
Eimeria—
avium, studies, 451.
caviae infections, allergy and immunity, 310.
spp. in fowls, 319; N.J. 74.
tenella infections of fowls, analyses, 74.
tenella oocysts, effect of physical and chemical agents, 457.

Elateridae—
genitalia, comparative anatomy, 706.
of China, catalogue and generic synopsis, 717.
Electric—
brooders, studies, Ind. 303.
dairy utensil sterilizer, new, 611.
heating, treatise, 191.
light, use in cultivation of plants, 115, 609, 659.
light, use in greenhouse, Ind. 523.
plowing in Europe, 609.
sterilizer, efficiency, Md. 594.
Electricity—
for dairy stable ventilation, 330.
for heating of hotbeds, Md. 524.
for hotbeds, coldframes, and propagating benches, 329, Mass. 386.
for soil heating, Calif. 605.
in agriculture of France, 609.
in horticulture, 754.
on farms, 79.
on farms, average possible load per *year, Ind.* 613.
on farms of Washington, uses, 175.
Electrode—
glass, behavior in solutions of sodium and barium acetate, 361.
quinhydrone-collodion, description, 202.
Electrodialysis—
apparatus, new modification, 13.
as measure of phosphate availability in soils, Ariz. 370.
of soil, conditions affecting, 13.
Elevator dust, feeding value, Tex. 723.
Elevators—
cooperative, operating practices, Mo. 619.
grain, volume of business, profits and loading margins, Ind. 613.
Ellopia fiscellaria, natural enemies, 284.
Elm—
American, Diaporthe canker, 148.
Chinese, tests, Tex. 673.
disease, cause, 48.
disease, Dutch, nature and control, Ohio 43.
disease, Dutch, spread, 284.
Elms, fungus affecting, Conn.State 535.
Elsinoe piri, synonymy, 554.
Embelin, anthelmintic value, 597.
Emmer—
and wheat cross, morphologic characters and rust resistance, relation, 140.
and wheat hybrids, partly fertile, 664.
for dairy cows, S.Dak. 159.
Empoasca mali, see Apple leafhopper *and* Potato leafhopper.
Empoasca species, closely related, biology, 710.
Empusa grylli, dissemination, 430.
Encephalomyelitis in horses and mules, Calif. 595.
Endive bacterial leaf rot, 694.
Endostigma inaequalis, notes, 410.
Engineering—
agricultural, progress of research in Europe, 75.
experiment stations, report, 462.
mechanical, laboratory methods and equipment, 77.
Engines—
Diesel, for tractor service, description, 326.
gas and gasoline, *see* Engines, internal-*combustion.*
internal-combustion—
and tractors, treatise, 325.
carburetor adjustment, 754.
lessening radiation in cylinders, 325.
manifold phenomena, 466.
performance, effect of fuel volatility, 465.
power, effect of humidity at altitude, 755.
tractor, *see* Tractor engines.
Entedon tachypterelli, notes, Colo. 719.
Enteritis, chronic, see Johne's disease.
Enterohepatitis, infectious, *see* Blackhead.
Enterotoxemia of sheep and lambs in Australia, 600.
Entomococci, rôle in protecting fruit against coccids, 285.
Entomology—*see also* Insects.
economic, problems, 49.
medical, treatise, 566.
research in Russia, 700.
Entomophthora sphaerosperma infection of *Pieris brassicae*, changes caused by, 433.
Entomosporium maculatum, notes, 264.
Enzymes—
action, determination, 210.
proteolytic, of malt preparations, 358.
Eomermis tenuissima, notes, U.S.D.A. 582.
Eperigone tridentata as greenhouse pest, 49.
Ephestia—
elutella—
biology and damage to raw tobacco in storehouses, 712.
effect on tobacco export trade of Rhodesia, 435.
on tobacco, 284.
kuehniella, see Flour moth, Mediterranean.
Epicauta—
lemniscata, life history, 56.
sericea, notes, Utah 287.
Epichloe typhina, control, 538.
Epichorista ionephela, notes, 428.
Epicoccum heterochroum, notes, 168.
Epilachna corrupta, see Bean beetle, Mexican.
Epitrix—
cucumeris, see Potato flea beetle.
subcrinita, notes, Wash.Col. 578.
Eretmocerus serius in Haiti, introduction, 558.
Ergosterol, irradiated—
large doses, effect on rats, 89.

Ergosterol, irradiated—Continued.
notes, N.J. 587.
toxicity, 779.
Ergot, biology and physiology, 119.
Eriodendron anfractuosum, notes, 426.
Eriophyes essigi, notes, 425.
Eriophyes pyri, see Pear leaf blister mite.
Eriosoma lanigerum, see Apple aphid, woolly.
Erysiphe—
graminis hordei, studies, U.S.D.A. 260.
graminis infection, effect of nutrition of grain, 691.
graminis, notes, 538.
Erythrocytes, formation, rôle of dietary factors in, 635.
Erythroneura pallidifrons, biology, 431.
Erythroneura spp., studies, Va. 51.
l-Erythrose, crystal structure, Calif. 500.
Escherichia coli—
and *Aerobacter aerogenes*, differentiation, 662.
effect of irradiation, Pa. 452.
Eskimos, metabolism studies, 87.
Ethoxyl group, determination, 206.
Ethylene—
dichloride—
and carbon tetrachloride for fumigation of clothes moths and carpet beetles, 566.
and carbon tetrachloride for fumigation of gladiolus corms, 430.
bibliography, U.S.D.A. 6.
gas, effect on coloring and ripening of apples and pears, 392.
gas, effect on ripening bananas, 136.
oxide, new fumigant for dried fruits, 287.
Ethyl-mercury chloride for seed grain disinfectant, 541.
Euaresta aequalis, notes, 576.
Eucalyptus plantations, beetles affecting, 293.
Eucosma—
argentialbana on chrysanthemums, 558.
gloriola n.sp., description, 435.
Eudemis vacciniana, see Fireworm, black-headed.
Eulia pinatubana in Yellowstone National Park, U.S.D.A. 707.
Eulimneria rufifemur, primary larvae, parasitic on European pine shoot moth, 290.
Eupelminus saltator, notes, Colo. 719.
Euryope terminalis, embryological development, 293.
Eurytoma—
amygdali, habits, 706.
tylodermatis, notes, Colo. 719.
Euscelis striatulus, notes, N.J. 561.
Euschistus spp. on pears, 709.
Eutettix tenella, see Beet leafhopper.
Euthrips tritici, see Flower thrips.
Euxoa obesa scytha, biology, 715.
Euzophera bigella on apple in central Asia, 706.
Ewes—see also Sheep.
cyclic changes in vaginal smear, 282.
minerals for, Iowa 444.
nursing, rations for, Ind. 588.
ovaries and tubal ova, Mo. 376.
range, feeding and finishing, Nev. 445.
Exanthematous fever, rôle of brown dog tick in transmission, 444.
Exoascaceae studies, 539.
Exoascus deformans, notes, 410.
Exorista pyste, notes, 571.
Experiment—
fields of Indiana, reports, Ind. 16.
Station Record, monthly issues, editorial, 193.
stations—see also Connecticut, Florida, etc.
classified list of projects, U.S.D.A. 612.
forest, see Forest.
in 1931, editorial, 641.
insular, changes in, editorial, 353.
organization list, U.S.D.A. 85.
report, 782.
Extension—
Service, report of director, U.S.D.A. 619.
work in agriculture and home economics, U.S.D.A. 619.
work, relation to land utilization, 469.
Fallowing, response of crops to, U.S.D.A. 30.
Farm—
accounting in Switzerland, 469.
animals, see Livestock and Animals.
building losses from fire, Iowa 462.
building losses in Iowa due to wind, 612, Iowa 462.
buildings in Belgium and Belgian Congo, 177.
buildings of rammed earth, S.Dak. 76.
buildings, replacement costs, Mo. 462.
business survey, Mo. 470.
credit, see Agricultural credit.
economics extension, origin, 469.
economics in United States, origin and development, 469.
families, diet as index of standards of living in, Utah 781.
families, standard of living in Montana, Mont. 637.
family living, data, Wis. 767.
flock management, cost and income records, N.Dak. 722.
homes, selection of site, house and garden plans, Oreg. 782.
homes, standards of living, Nebr. 190.
houses, designs for Kansas, 350.
houses, foundations for, U.S.D.A. 350.
houses, plans, U.S.D.A. 349.
incomes, effects of production and 1930 business depression, 469.
labor, see Agricultural labor.
lands, classification for assessment in Wisconsin, 471.
lands, mineral resources of, 331.

Farm—Continued.
- layout, relation to fencing costs and organization, Ind. 613.
- leasing, stock-share, and changes in land values, Iowa 470.
- machinery, *see* Agricultural machinery.
- *management*—
  - business surveys, N.J. 613.
  - human factor in, 470.
  - research, coordination, in Western States, 469.
  - research, philosophy of Aereboe, 469.
  - studies, R.I. 332.
- mortgage agencies in readjustment, functions, U.S.D.A. 614.
- mortgage situation, Ohio 80; U.S.D.A. 181.
- mortgages and land values, Iowa 470.
- organizations, cooperative, membership and products marketed, Md. 613.
- power, utilization and cost, Iowa 470.
- practices that pay, Ill. 180.
- products, *see* Agricultural products.
- profits, determining, Ind. 613.
- real estate, foreclosures on, Ohio 331.
- real estate situation, U.S.D.A. 80.
- records and accounts, Iowa 470.
- relief and agricultural depression in England, 471.
- structures, research in, U.S.D.A. 177.
- taxation, *see* Taxation.

Farming—*see also* Agriculture.
- dairy, *see* Dairy farming.
- dry-land, *see* Dry farming.
- flood-water, 462.
- in Corn Belt to meet corn borer conditions, U.S.D.A. 180.
- systems, adjustments in, Minn. 758.

Farms—
- electricity on, *see* Electricity.
- in State operated entirely by mechanical power, Ind. 613.
- income and costs of production, Ala. 759.
- size and labor used on, Md. 613.

Farnham House Laboratory, organization and progress of work, 287.

Fasciola hepatica in rabbits, longevity, 605.

Fat, body, composition, effect of ingested cottonseed oil, 61.

Fat, sparing action on vitamin B, 778.

Fats—*See also* Oils.
- distribution and quantity, in rats, 773.
- in ice cream, factors affecting, Iowa 209.
- need in diet, review of recent literature, 475.

Fatty acids, unsaturated, vital need of body, 773.

Feathered World yearbook for 1922, 303.

Federal—
- bureaus and independent institutions, classified list of projects, U.S.D.A. 612.
- Farm Board, general objectives, U.S.D.A. 613.

Federal—Continued.
- prisoners, diets of, 474.

Feed mills, performance, characteristics, 328.

Feeding experiments, *see* Cows, Pigs, *etc.*

Feeding stuffs—
- for cattle, deficiencies in, Fla. 593.
- home grown, utilization, 234.
- in retail Ohio trade, Ohio 470.
- inspection and analyses, Conn.State 590; Ind. 590.
- machinery for processing, new developments, 177.
- special-purpose, approved formulas, Tex. 724.

Fence posts, durability, Mo. 462.

Fenusa pumila—
- and *Phyllotoma nemorata*, differentiation, 722.
- notes, 565.

Fermentation—
- acetone-butyl alcohol, oxidation and reduction relations, 5.
- alcoholic, treatise, 201.
- *of carbohydrates, production of organic acids by*, U.S.D.A. 359.

Fern diseases, Fla. 536.

Fern scale, life history and control, 711.

Fertility and lactation, dietary requirements, 484.

Fertilizer—
- distributors, Iowa 462; Mass. 462.
- experiments—*see also special crops*.
  - cooperative, Nebr. 505.
- materials from minor sources, conservation, U.S.D.A. 19.
- requirements of soils, *see* Soils.

Fertilizers—
- American, production, U.S.D.A. 507.
- analyses, N.J. 19, 115.
- analytical methods for, 7.
- cooperative experiments in Ontario, 234.
- effect on composition of pasture grasses, 236.
- effect on firmness and flavor of strawberries, 393.
- effect on microbiological activities in virgin peat, 221.
- for greenhouse and garden crops, treatise, 245.
- functions, sources, and properties, N.J. 870.
- improved placement in the hill for corn, Ohio 468.
- inspection, Ind. 659.
- *inspection and analyses*, Mo. 223; N.H. 116.
- loss by leaching, P.R. 525.
- methods of application, Wis. 657.
- nitrogenous, *see* Nitrogenous fertilizers.
- registrations, N.J. 115.
- studies, La. 222; Ohio 16.
- use in tropical and subtropical agriculture, 113.

Feterita—
- as catch crop, U.S.D.A. 30.

Feterita—Continued.
variety tests, U.S.D.A. 30.
Feudal system in *Persia*, 469.
Fiber—
crude, *see* Cellulose.
plants, improvement in Russia, 234.
Fibrinogen, combining power, effect of acid *denaturation*, 196.
Fideol No. 1, fungicidal value, 690.
Field crops—*see also* Crops, Forage crops, Root crops, *etc.*
cooperative experiments in Ontario, 234.
management for Cayuga County, N.Y. Cornell 234.
Field experiments, accuracy, 123.
Fig—
diseases, control, Calif. 535.
leaf rust, notes, 265.
trees, lateral root spread, Tex. 531.
Figs—
culture experiments, Miss. 35.
pruning, Miss. 35; Tex. 673.
Sclerotinia limb blight, 555.
structure and development of flowers, Calif. 260.
studies, Calif. 526.
variety tests, Miss. 35; Tex. 673.
vitamins in, 776.
Fir woods of North America, identification, 137.
Fire ants, control, Tex. 706.
Fire blight—
Bordeaux mixture for, Wis. 690.
control, Ohio 38.
organisms, rôle of bees in spread, 294.
Fire brat in buildings, control, Idaho 294.
Fires, forest, *see* Forest fires.
Fireworm, black-headed—
and red-striped, on cranberries, Mass. 428.
notes, 284.
Fish meal—
and kelp v. cottonseed meal, feeding value, Ohio 65.
effect on quality of pork, Ohio 58.
feeding value, 59; Ohio 591.
nitrogen balance studies, 589.
vitamin A and proteins in, 589.
Fish meals, comparative value for chicks, Ohio 58.
Fish, Ontario, plerocercoids of genus Ligula from, 596.
Fishing industry by-products as animal feed, 589.
Fish-liver *oils, antimony trichloride* and ultra-violet absorption tests, 102.
Fistula in horses, relation to *Bacterium abortus*, 168.
Flax—
development, relation to spacing, 128.
disease resistant varieties, N.Dak. 695.
facts, supplement to, 238.
fertilizer experiments, Mich. 33.
straw *v. alfalfa* hay for cattle, S.Dak. 58.
varieties, oil in seed, N.Dak. 667.
Flax—Continued.
variety tests, Iowa 378; N.Dak. 667; *Wyo. 30.*
water requirements at different growth stages, S.Dak. 30.
wilt resistant varieties, N.Dak. 695.
Flaxseed—
new form of *Botrytis cinerea* on, 695.
oil tests for, U.S.D.A. 84.
treatment, tests, Iowa 378.
Fleas, sticktight, of hens, dispersal, 576.
Fleming, S. T., necrology notes, 639.
Flies—
biting, of Adirondacks, 716.
European scavenger, breeding in corn silage, 291.
house, *see* House flies.
important in forest entomology, 285.
injurious to cereals, biology, 716.
on mushrooms, biology and control, 565.
scavenger, on hides, 437.
two-winged, description, Tex. 576.
two-winged, new species, Tex. 576.
white, *see* White fly.
Flood of 1931 in China, 471.
Flood water farming, 462.
Flora, changing, in Southwest, 720.
Florida Station, notes, 351, 639.
Florida Station, report, 638.
Flour—*see also* Bread.
acidity in, determination, 366.
baking strength, effect of quality of dry skim milk, 339.
baking tests, separation of gassing power *(diastatic activity) from* strength, 338.
beetle, confused—
effect of humidity on value of *fumigants*, 578.
population growth, 579.
composition, relation to crumb texture and color, 473.
heat of hydration, 357.
keeping quality, factors affecting, Ind. 620.
moth, Mediterranean, effects of desiccation, 570.
protein and loaf volume, effect of potassium bromate, 365.
protein extractions, comparison of solutions for, 357.
proteolytic enzymes of, 358.
quick ashing, method, 365.
self-rising and phosphated, ash content, determination, 365.
soft wheat, fermentation, Mich. 620.
Wyoming, baking quality, effect of storage, Wyo. 85.
Flower—
seedlings, damping-off control, Ohio 43.
seeds, starting, Ohio 86.
thrips, studies, Calif. 559; Fla. 559.
Fluids, passage through stomach of animals, 165.
Flukes, infestation of ducks and chickens, 585.

Flumes, Parshall, data, Colo. 606.
Fluorides ingestion by rats, effect, Iowa 473.
Fluorine—
 and arsenical insecticides, relative toxicity, 428.
 compounds and residue problem, 50.
 compounds as substitutes for lead arsenate, 425.
 effect on growth and bone development in pigs, Ohio 58.
 excess, in drinking water, effect on teeth, 93.
Fly sprays for cows, efficiency, 576.
Flycatchers, field key, N.J. 49.
Fodder crops, *see* Forage crops.
Fomes sp., notes, 264.
Fomes spp., notes, U.S.D.A. 280.
Food—*see also* Diet.
 and nutrition, chemistry of, treatise, 768.
 materials of India, analyses and calorific values, 337.
 materials, Philippine, nutrients in, 337.
 of the family, treatise, 336.
 of the farm family, Ohio 337.
 supply of family, home production, Mich. 190.
 waste in sorority and fraternity houses, energy and protein content, N.H. 86.
Foods—
 canned, *see* Canned foods.
 defrosted frozen, bacteriological studies, Mass. 473.
 drying, *see* Drying.
 home canning for family use, Ill. 769.
 irradiation, patent grants dealing with, 491.
 preserving by quick freezing and refrigeration, 469.
 structure and composition, 472.
 vitamin B (B_1) values, comparison, 186.
 vitamins in, factors affecting, Pa. 185.
Foot-and-mouth disease—
 and vesicular stomatitis, 167.
 in Southern Rhodesia, 598.
Forage—
 consumption by lambs, yearling sheep, and ewes, Nev. 445.
 crop diseases, N.Dak. 690.
 crops—
  comparison, Ohio 592.
  culture experiments, Nebr. 517.
  drying, artificial, 610.
  tests, Ohio 517.
  under irrigation, Mont. 518.
  variety tests, Nebr. 517.
 grasses, *see* Grasses.
 mixtures, tests, 123.
 moisture content at different times in day, 125.
 pests, 286.
 plants, range, analyses, Wyo. 81.
 plants, structure and composition, 472.
 plants, value for range reseeding, Calif. 583.
Forage—Continued.
 poisoning, *see* Livestock poisoning, Plants, poisonous, *and specific plants*.
Forest—
 administration, *see* Forestry.
 entomology, manual, 287.
 Experiment Station, Lake States, establishment of field laboratories, 95.
 fire forecasting service, U.S.D.A. 11.
 fires in redwood region, effect, Calif. 398.
 insects, experiences of a forest ranger, 285.
 insects in district of Lunz, relation to climate, 285.
 land use in Wisconsin, 759.
 litter in Connecticut, calcium content, 686.
 mensuration, treatise, 688.
 News of Ohio, Ohio 398, 688.
 policy, national economic and social objectives in, U.S.D.A. 614.
 protection, value of animal and plant distribution information, 426.
 Service activities, laws relating to, U.S.D.A. 41.
 soils, formation, N.H. 505.
 tax laws in 1932, digest, U.S.D.A. 615.
 taxation in North Carolina, U.S.D.A. 181.
 trees, *see* Trees.
Forestry—
 and naval stores terms, glossary, U.S.D.A. 535.
 at Ohio Station, Ohio 41.
 in redwood region, U.S.D.A. 534.
Forests—
 American, growth per cent, 688.
 effect on erosion and surface run-off, 607.
 national, laws relating to, U.S.D.A. 41.
Formaldehyde—
 for control of damping-off in seedbeds, Iowa 398.
 fumigation of incubators and chicks, 460.
Foulbrood v. California, 156.
Foundations, selection, 463.
4-H club work in United States, bibliography, U.S.D.A. 472.
Fowl—
 cholera, epizootologic behavior, Nebr. 602.
 cholera resistance, effect of radiation, 320.
 paralysis, *see* Paralysis.
 pest transmission experiments with yellow fever mosquito, 171.
 pox, immunization, 596; N.H. 596; N.J. 603.
 pox immunization at various ages, effect upon growth gains, 321.
 pox, immunization of young chicks against, 452.
 pox immunization, stick method, 456.

Fowl—Continued.
  pox immunization with pigeon pox virus, 321.
  pox, studies, 450, 746; Ohio 603; R.I. 318.
  pox vaccine, notes, 450.
  pox vaccine, use, N.H. 596.
  tick, webbing clothes moth as predator, 284.
  typhoid in poultry, breeding for resistance, Iowa 450.
Fowls—*see also* Chickens, Hens, Poultry, etc.
  characters in, Mass. 446.
  color chimeras in, 27.
  effect of radiations, Tex. 723.
  hermaphroditism in, 596.
  inheritance of body weight, 376.
  prolapse of cloaca and oviduct, Mich. 459.
  virus diseases, 746.
Fox ranches, parasitism, prevention and control, 596.
Foxes—
  distemperlike disease, 171.
  female, composition of milk, 65.
  flying, in Australia, 420.
  parasites, control, 318.
  silver black, susceptibility to canine distemper virus, 596.
  silver, disease, relation to disease of sledge dogs, 318.
  silver, on experimental ranch, Can. 419.
Frankliniella—
  californica on apricots, Calif. 559.
  insularis, notes, 151.
  insularis, relation to tomato spotted wilt, 430, 551.
Freesia core rot, Tex. 690.
Frit fly—
  flight habits, 284.
  in England, 437.
  nematode parasite of, 292.
Frogs, biology and economic importance, 558.
Frost—
  and preceding meteorological conditions, correlation, 107.
  injury to vines, physiological derangements, 117.
Fructose, determination in corn tissues, 208; Ohio 29.
Fruit—
  bud formation in strawberries, Mass. 385.
  bud studies of Sultana grapes, 395.
  diseases and control, N.J. 536.
  flies, new bait for, 291.
  flies of the genus Rhagoletis, North American species, revision, 154.
  [illegible]rranean, eradication from [illegible]560.
  [illegible]lfactory reactions and non-poisons for, 426.
  [illegible]mpire, 677.
  [illegible]k freezing, 622.
Fruit—Continued.
  juices, utilization studies, Mass. 473.
  moth, oriental, *see* Peach moth, oriental.
  products, preservation, Calif. 622.
  specimens, diseased, light box for photographing, 374.
  spot, control, 551.
  tree root development and soil profile, relation, Mich. 37.
  tree sour sap, cause, 700.
  trees, composition, effects of bark ringing, 133.
  trees in Baluchistan, new coccid affecting, 152.
  trees in Illinois, epidemic diseases, 410.
  trees, irrigation, 249.
  trees, nutrition, relation of nitrogen to potassium, 133.
  trees, pollination, N.Y.State 677; Ohio 524.
  trees, pruning, Ohio 524.
  trees, spraying and dusting experiments, 274.
  trees, spraying, cost of summer and winter washing, 411.
Fruits—*see also* Orchards, Apples, Peaches, etc.
  blooming data, N.J. 524.
  breeding activities, survey, S.Dak. 36.
  breeding, recording and analyzing data, 677.
  car-lot movements, Tex. 757.
  carotenoid content, relation to light, 245.
  citrus, *see* Citrus.
  culture and variety tests, La. 130.
  damage during shipment, causes, Ill. 765.
  dried, ethylene oxide as insect fumigant for, 287.
  ethylene treatment, variation in time, 244.
  fertilizer experiments, 387; Ohio 524.
  frozen, use in ice cream and ices, Mass. 447.
  imported Canadian, wastage in, 410.
  insects affecting, Fla. 559.
  iron in, U.S.D.A. 85.
  market diseases, U.S.D.A. 270.
  market diseases, identification, U.S.D.A. 406.
  pests, 286.
  phenological and variety tests, N.Mex. 35.
  pollination methods, recent discoveries in, 392.
  preservation by quick freezing, 96.
  propagation, Hawaii 385.
  ripening, physical and chemical changes in, Calif. 251.
  rootstock and propagation studies, Nebr. 524.
  small, breeding, Tex. 673.
  small, breeding, chromosome behavior as factor, 682.
  small, seed and berry size, 394.

Fruits—Continued.
- small, variety tests, N.J. 524; Tex. 673.
- *smudging experiments for frost protection*, N.Mex. 35.
- stone, bacterial spot disease, U.S.D.A. 145.
- stone, disease control, Calif. 535.
- stone, new type of pressure tester for, 392.
- tests, Fla. 523.
- thinning, Ohio 524.
- *utilization studies*, Mass. 473.
- variety tests, Fla. 523; Mass. 385; Ohio 524; Tex. 674.
- vitamin B (B_1) in, 634.

Fuel briquet from southern pine sawdust, 465.

Fuels and lubricants, survey, 325.

Fuels, motors, volatility, 465.

Fumigants for greenhouse pests, Mass. 424.

Fumigation—
- house, with ethylene oxide-liquid carbon dioxide mixture, 50.
- of woodwork of buildings, apparatus for, 429.

Fungi—
- blue-staining, in lumber yards, 704.
- edible and poisonous, 23.
- inorganic nutrition, 23.
- mycorrhiza-forming, identity, determination, 512.
- new, on corn in Illinois, 694.
- of Iowa parasitic on plants, 263.
- of plants in Argentina, 264.
- parasitic on plants, biology, 401.
- parasitic, studies, 690.
- wood-destroying, life conditions, 419.
- wood-destroying, oxidases in, 48.

Fungicides—*see also* Sprays *and specific kinds*.
- analyses, Me. 674; N.J. 36.
- copper, *see* Copper.
- dust, activation by external factors, 690.
- for quick steeping of seed grains, 43.
- studies, 690.
- *tolerated or toxic dosage*, 266.

Fur-bearing animals of Alaska, laws and regulations, U.S.D.A. 280.

Furfural formation and separation from xylose, 364.

Furs, cold storage, 566.

Fusarium—
- *cubense inodoratum*, notes, 416.
- *cubense*, notes, 276, 405.
- *culmorum*, notes, 268, 542.
- *martii phaseoli*, notes, 141.
- *moniliforme* from corn, pathogenicity and variability, W.Va. 139.
- *moniliforme*, notes, 272.
- *niveum*, pathogenicity, Iowa 143.
- *oxysporum*, notes, 407.
- sp. on narcissus bulb, 556.
- spp., cause of pea wilt, 269.
- spp., notes, 405; Fla. 536.
- *vasinfectum*, diseases due to, 265.

Fusarium—
- disease of corn, control, 400.
- on eggplant and plantain, 265.
- *wilt of watermelon, control*, Fla. 535.

Fusicladium dendriticum, *see* Apple scab.

Fusicladium saliciperdum, biological studies, 703.

Galeruca bang-haasi in south Manchuria, life history, 293.

Galerucella lineola, control, 284.

Gambrus tricolor, notes, 157.

Game—
- Commissioners of Pennsylvania, report, 419.
- in Zululand, blood parasites of, 70.
- of Alaska, laws and regulations, U.S.D.A. 280.

Garden—
- demonstration, results with, Ind. 673.
- insects and pests in Ceylon, 426.
- insects, control, 424, 560; Ill. 150; N.Mex. 50.
- winter, region of Texas, resources and crops, Tex. 758.

Gardens—
- hardy flower, treatise, 398.
- maintenance, treatise, 398.
- old, in and about Philadelphia, treatise, 398.

Gas—
- engines, *see* Engines, internal-combustion.
- home-heating equipment, tests, 493.
- illuminating, effect on plants, 380.
- illuminating, stimulative effect on trees, 510.

Gasoline—
- safe use and storage on the farm, U.S.D.A. 174.
- straight-run Pennsylvania, knock rating, 174.

Gastric—
- digestion, survey, 769.
- juice, specific hematopoietic hormone in, 629.
- mucin, treatment of peptic ulcer with, 492.

Gastrophilus equi, *see* Horse botflies.

Gelatin—
- effect of surface-active substances, 99.
- membrane, effect of water content on osmotic transfer, 21.

Gelechia gossypiella, *see* Bollworm, pink.

Gelechia trialbamaculella, notes, Mass. 428.

Genetic research in British Empire, 512.

Geocoris decoratus, predator of beet leafhopper, 569.

Georgia Station, notes, 95, 639.

Germicides for preservation of biologic products, 739.

Ginseng spraying experiments, Ohio 43.

Gipsy moth—
- control, results, 565.
- egg clusters, brush for applying creosote to, U.S.D.A. 53.
- in New Jersey, *results of eleven years'* work, 433.

Gipsy moth—Continued.
in Pieve forests, 285.
problem, status and future requirements, 570.
spread, Conn.State 559.
Gladioli—
as cut flowers, keeping quality, 261.
flower bud differentiation, 685.
forcing, effect of light, Mass. 385.
forcing experiments, 261; R.I. 244.
growth relation to corm diameter, Ohio 36.
new Taeniothrips on, 709.
varieties, Iowa 385.
varieties in trial gardens at Iowa State College, Iowa 685.
Gladiolus—
corms, storage, Iowa 385.
corms, treatment, Ohio 43.
thrips, control, 430, 705; Ohio 50.
Glands—
germ, transplantation experiments, 27.
transplantation in sheep, effect on wool growth, 27.
Glass—
substitutes, use, N.J. 524.
ultra-violet ray, experiments, 386.
Gloeosporium—
limetticolum, notes, 47, 399, 400.
pestis, proposed name, 143.
Glomerella cingulata, notes, 556.
Glucose—
in corn tissues, 208; Ohio 29.
loss from dried peas on soaking, 621.
Glutamic acid as iron supplement for nutritional anemia, 91.
Glutathione, crystalline, oxidation catalysis, 197.
Glutelins, cereal, preparation and study, Nebr. 500.
Glycerides of single fatty acids, sparing action for vitamin B (B_1), 779.
Glycine, determination, 364.
Glycogen, hydrolysis, 198.
Glycogen in tissues, determination, 207.
Glycollic acid, titration in presence of ferric and cupric salts, 203.
Glypta rufiscutellaris, parasite of oriental peach moth, 442.
Gnomonia pseudoplatani n.sp. on maple leaves, 557.
Gnorimoschema—
lycopersicella, new pest in Pennsylvania, 50.
tuberosella, new potato pest, 49.
Goat lice, control by dipping, Tex. 705.
Goats—
fleece weight, relation to skinfolds, Tex. 723.
inheritance studies, Tex. 665.
Goiter—
in New Zealand, relation to iodine occurrence, 487.
parenchymatous, in silver black foxes, 596.
Goldenrod, honey flow, relation to temperature, 720.
Goldfish, toxicity of plant extracts to, 51.
Gonderia mutans, notes, 743.
Gooseberries—
fertilizer experiments, 388.
new variety, description, U.S.D.A. 395.
variety tests, N.Dak. 673.
Gooseberry fruit worm, biology, 434.
Gossypol—
poisoning, susceptibility of animals, *Ohio* 58.
toxicity, 296.
Government, local, costs, Ohio 80.
Grafts, stand, effect of position of top bud of scion on, 132.
Grain—
aphid, spring, biology, 706.
behavior in grinding, 177.
diseases, N.Dak. 690.
dust explosions, 468.
elevating, 175.
elevating machinery, Wash.Col. 610.
feeding methods for economical milk production, Nebr. 594.
following sorghums, nitrogenous fertilizers on, 667.
grading, artificial illumination for, 335.
harvesting and drying, Mo. 462.
harvesting and handling by sack or by bulk methods, U.S.D.A. 180.
harvesting, header barge method, 756.
household and market value, effect of insect damage, 706.
markets, cash, and future trading, U.S.D.A. 85.
mixtures for dairy cattle, bulk as factor, 594.
nutrition, effect on Erysiphe graminis infection, 691.
planting, drilling depth regulation, 176.
production, effect of fallowing, 123.
rate of drying in windrows, shocked, and uncut, Ohio 75.
rotation, four-year, nitrogen balance in, 17.
seed, ethyl-mercury chloride as disinfectant, 541.
seeding, single kernel and broadcasting, 176.
stored, temperature, effect of molds, 662.
trade *statistics*, guide, U.S.D.A. 618.
whole, methods of feeding, Ohio 58.
Grains—*see also* Cereals *and* Oats, Rye, Wheat, *etc.*
and grain products in major markets, import duties, 335.
and legumes in combinations, variety tests, Mich. 31.
comparison for fattening calves, Mich. 60.
following sorghums, fertilizer experiments, Calif. 516.
spring, tests, Ohio 517.
Gram pests, 286.
Grama grass, tests, N.Mex. 29.
Grape—
berry moth, control, Mich. 54.

Grape—Continued.
berry moth, life history, Del. 571.
court-noué, cause, 46.
cuttings, Concord, growth factors in, 683.
diseases, copper sprays v. copper dusts for, 701.
insects, control, 425.
leafhopper, control, 705; Calif. 559.
mildew, summer treatments, 46.
Grapefruit—
cold storage studies, Fla. 523.
culture, U.S.D.A. 35.
culture experiments, Tex. 673.
fertilizer experiments, Fla. 523.
irrigation experiments, Ariz. 396.
on rough lemon and sour stocks, chemical studies, Fla. 523.
storage experiments, Tex. 396, 674.
studies, Calif. 526.
vitamin C in, 344.
vitamins in, 776.
Grapes—
American, grafting on vigorous stocks, N.Y.State 136.
and products, effect on urinary acidity, 478.
Concord, effects of pruning on fruiting and growth, 683.
Concord, *shoot growth, effect of fruiting*, 259, 683.
culture, Miss. 35; U.S.D.A. 35.
fertilizer and grafting experiments, R.I. 244.
fertilizer experiments, Mo. 386.
greenhouse grown, pest on stems, 559.
irrigation, 683; Calif. 605.
irrigation, duty of water for, N.Mex. 76.
length of fruit developmental period, N.J. 524.
maturity tests, Calif. 531.
muscadine, culture and variety tests, La. 130.
pruning, Mass. 385; Miss. 35.
respiration rate and other metabolic activities, 260.
spray schedule for, N.J. 38.
studies, Calif. 526.
Sultana, fruit bud development, 395.
varieties and districts in United States, U.S.D.A. 259.
varieties for jelly making, Fla. 620.
variety tests, Miss. 35; N.Dak. 673; Tex. 673.
vinifera, breeding, 684.
Grapevines, *excrescences*, cause, 415.
Graphium and Ceratostomella, relationship, 704.
Grapholitha schistaceana, notes, 562.
Grass fly, Phalaris, parasites of, 285.
Grass sorghums, chromosomes in, 374.
Grass tetany, treatment, 167.
Grasses—*see also* Grassland, Lawns, Meadows, *and* Pastures.
and other pasture plants, analyses and tests, V.I. 518.

Grasses—Continued.
barnyard, and Japanese millet, differences, 285.
development, effect of cutting and fertilizers, 32.
for hay and pasture, tests, Iowa 378.
for hay, tests, Ohio 29.
forage, of Belgian Congo, 125.
forage, variety tests, N.Dak. 667; Wyo. 31.
in Samara, 706.
native, nutrient constituents, Calif. 533.
pasture, fertilizer and lysimeter studies, Fla. 516.
turf, nitrogen carriers, Ohio 29.
varieties for golf putting greens, R.I. 233.
variety tests, Fla. 516; La. 233; Tex. 668.
water requirements, 234.
Grasshopper—
differential, *devastation of large area* by, 567.
two-striped, devastation of large area by, 567.
Grasshoppers—
control, U.S.D.A. 151.
cyrtacanthacrine, notes, S.Dak. 51.
in northwestern Florida, control, 709.
in western Iowa, control by airplane, 567.
increase in western Canada, 283.
injurious to crops, N.Mex. 50.
outbreak in Minnesota, 567.
poisoning campaign, 423.
relation to alfalfa seed production, Utah 287.
studies, Mo. 424.
tracheal ventilation, effect of gases, 567.
Grassland—*see also* Grasses, Meadows, *and* Pastures.
fertilizer experiments, 124; Mass. 367.
management, intensive system, 157, 297.
nitrogenous fertilizers for, 125.
Grazing—*see also* Range.
studies, Ind. 533.
Green—
bug, *see* Grain aphid, spring.
manure—
crops for sugarcane plantations, 672.
in citrus groves, Fla. 523.
insects affecting, 565.
vetch, decomposition, relation to surrounding soil, 112.
manuring experiments, 124.
manuring experiments at Woburn, 17.
scale, hydrocyanic acid gas concentration for control, 711.
tomato bug, *see* Stink bug, southern green.
Greenhouses, artificial illumination for, 609.
Growth—
biochemical aspects, 769.

Growth—Continued.
effect of vitamin B, 484.
in infancy, composition, 475.
of rats, relation to acid-base balance of ration, 627.
rate, effect of diet, 772.
Guam Station, *notes*, 639.
Guinea pigs, hereditary and growth factors, correlation, U.S.D.A. 27.
Gusanol, effect on cattle grubs, Mich. 55.
Gymnosporangium—
juniperi-virginianae, notes, 410.
spp., notes, 552.
Gypsum added to soil, effect on tobacco, Conn.State 383.
Habrocytus cerealellae, studies, 583.
Habrocytus spp., notes, Colo. 719.
Habronema whitei, notes, 70.
Haemadipsa zeylanica, transmission of surra by, 743.
Haemaphysalis cinnabarina, notes, 455.
Haematoporphyrin, photosensitizing effect on sheep and goats, 70.
Haemonchosis in sheep, haematology and pathology, 70.
Haemonchus contortus, biology, Tex. 168.
Haemonchus contortus, notes, 601, 602.
Hail formation and prediction in Hungary, 210.
Hainesia lythri, notes, Mich. 46.
Halibut liver oil, vitamin A in, 777.
Hapalia machaeralis, notes, 562.
Harmolita eremita in Samara, 706.
Harmolita spp. in ryegrass, 558.
Hortertia—
natalensis n.sp., notes, 70.
zuluensis n.sp., notes, 70.
Hawaii Station, report, 494.
Hawthorn seedlings, characteristics, 37.
Hay—*see also specific kinds.*
artificial drying 328; La. 322.
crop mixtures for, Ohio 30.
crops, effect of limestone, Ohio 30.
crops, variety tests, N.J. 517; N.Mex. 29.
drier, test, 327.
fertilizer experiments, 123.
field-cured and artificially-cured, vitamins in, Nebr. 594.
fork for storing hay, Iowa 462.
mixtures, tests, Ohio 517.
native, palatability for dairy cattle, Wyo. 65.
plants, annual, comparison of varieties, N.J. 379.
production, N.H. 505, 613.
storing by chopping and elevating, La. 322.
time of cutting experiment, N.H. 517.
yield and cost per acre, Md. 613.
yields, effect of drought, Ohio 30.
Haydite as wood substitute for beehives, 720.
Heartwater, control, papers on, 70.
Heat—*see also* Temperature.
conductivity of building materials, effect of moisture, 464.
Heating—
domestic, utilization of anthracite for, 191.
electric, treatise, 191.
Heifers—*see also* Cows.
effect of sunlight on growth and health, S.Dak. 65.
fat, carcass studies, Mo. 445.
feeding experiments, Md. 594; N.J. 594.
immunity to *Brucella abortus*, Ind. 596.
Helicobasidium purpureum, notes, 405.
Heliothis obsoleta, *see* Bollworm *and* Corn ear worm.
Heliothrips femoralis, notes, 51.
Helminth—
infections, susceptibility and resistance to, 750.
infestations, chemotherapy, 750.
parasites of deer, 605.
parasites of domestic animals in India, 750.
Helminthosporium—
avenae sativae in Scotland, 543.
gramineum, notes, 538.
oryzae, notes, La. 268.
sp., notes, 400.
spp. growth, factors affecting, 42.
spp. on barley, 403.
zeicola, notes, 694.
Helminthosporium, saltation in, 42.
Hematology, clinical, of domestic animals, treatise, 310.
Hemicelluloses, studies, 4.
Hemichionaspis aspidistrae, *see* Fern scale.
Hemileia vastatrix, seasonal periodicity, 146.
Hemisarcoptes coccisugus, enemy of oystershell scale, 283.
Hemiteles hemipterus, notes, 157.
Hemlock—
seedling analysis in field, inaccuracy, 534.
spanworm, natural enemies, 284.
Hemoglobin—
formation in pigs, copper as iron supplement, 348.
formation, relative value of inorganic and organic iron in, 479.
production on specific proteins, Iowa 473.
production, value of amino acids, 92.
regeneration, effect of iron plus supplements, 346, 348.
regeneration, factors involved in, 348.
regeneration, rôle of copper in, 87.
Hemoglobinemia production by inorganic elements, 347.
Hemopoiesis in liver and bone marrow of carrier pigeon, 451.
Hemorrhage in spinal cord of lamb, paralysis from, 168.
Hemorrhagic septicemia, *see* Septicemia.
Hemp improvement, Wis. 669.
Hemp, manila, *see* Abaca.
Hendersonia togniniana, notes, 204.

Hens—
laying—*see also* Egg production.
barley v. corn in ration, N.Dak. 722.
effect of all-night lights for, Ohio 58.
feeding experiments, Wyo. 59.
free choice of whole grain and mash concentrate for, Ohio 593.
kept in wire cages, Ohio 303.
metabolism of calcareous materials by, S. Dak. 58.
rations for, Ohio 302.
pullorum-infected and noninfected, hatchability of eggs and livability of chicks, 318.
Hepaticola hepatica, structure and relationships, 149.
Hepatitis, enzootic, studies, 451.
Heptylresorcinol and hexylresorcinol, anthelmintic properties, comparison, 810.
Heredity—
genetical interpretation of statistics, 24.
in barley, 375.
in pigeons, 231.
in poultry, 26.
in ragi, 25.
in rice, 375.
in sheep and goats, Tex. 665.
in wheat cross, 230.
of awn color in wheat, 229.
of body weight in fowls, 376.
of chlorophyll characters in sorghum, 515.
of chlorophyll deficiency in new world cottons, 227.
of color, *see* Color inheritance.
of colored scutellums in corn, U.S.D.A. 515.
of dwarfing in wheat, Utah 663.
of flower and tuber color in potato, 228.
of heading characteristics in lettuce, 248.
of lint percentage in cotton, 24, 25.
of milk and butterfat, 66.
of milk and fat production of cows in Zieckau, 119.
of oat blast resistance, 267.
of polythelia in dairy cattle, Mo. 448.
of resistance to corn seedling blight, 544.
of resistance to fowl paralysis, 321.
of size and shape in tomatoes, Iowa 385.
of size, linkage in, 231.
of wheat smut, stinking, in crosses, 140.
of wheat smut, stinking, resistance to, Conn.State 535.
of White Burley character in tobacco, 515.
of white sheath in corn, 663.
peculiar, of spike density in wheat, 229.
Herronia sp., notes, 399.
Hessian fly parasite, seasonal history and morphology, 443.
Heterakis gallinae, notes, 282.
Heterocera of Puerto Rico, 573.
Heterodera—
radicicola, *see Caconema radicicola* and Nematodes.
rostochiensis, use of term, 270.
schachtii, morphology, 270.
schachtii rostochiensis, notes, 408.
Heterofertilization in corn, 226.
Heterosporium in old millet grains, toxicity, 265.
Hevea brasiliensis, *see* Rubber.
Hexamethylenetetramine, reagent for precipitation of hydroxides of metals, 362.
Hexuronic acid, antiscorbutic value, 649.
Hexuronic acid, studies, 645.
Hexylresorcinol and heptylresorcinol, anthelmintic properties, comparison, 810.
Hickory bark beetles, 566.
Hickory shuckworm, notes, Fla. 559.
Hides, scavenger flies on, 437.
Highway—
and street intersections, design, U.S.D.A. 754.
appropriations, how used, U.S.D.A. 463.
traffic capacity, U.S.D.A. 463.
Highways, *see* Roads.
Hippodamia tredecimpunctata, notes, 50.
Histidyl-histidine, titration constants, 196.
Hitching, multiple, and draft eveners, 175.
Hog cholera—
antiserum and virus, *Brucella suis* in, Mich. 71.
cellular changes in pigs' blood during, 817.
histological studies, 317.
in China, 73.
transmissibility and prevention by quarantine, 745.
vaccine, preservation by eucalyptus oil, Calif. 595.
virus, attenuating with chloroform, 317.
virus, notes, 450.
Hog peanut, length of day relation to flowering behavior, 117.
Hogs, *see* Pigs.
Holly—
Christmas, deterioration in transit and storage, U.S.D.A. 42.
insects, notes, 284, 425.
Hollyhocks, injury from potato leafhopper, 568.
Home making, textbook, 493.
Home management and equipment, Ind. 637.
Honey—
flora in Southwest, changes in, 720.
flow from goldenrod, relation to temperature, 720.
gathering, ripening, and storing by bees, time and labor factors, Iowa 424.
granulation, 156.
in storage, deterioration, 721.

Honey—Continued.
- products, distribution, Tex. 705.
- storage, effect of low temperature, Wis. 706.
- stored, moisture in top and bottom layers, 653.

Honeydew melon fruit rot, 548.
Hookworm in sheep and goats, control, 602.
Hookworms, infestation, Fla. 620.
Hop disease, new, cause, 695.
Hop gardens, dew formation in, measurements, 108.
Hornets, population of nest, 581.
Horse—
- botflies, eradication, 318.
- sickness, African, studies, 74.
- sickness, notes, 452.

Horseflies—
- of Minnesota, Minn. 574.
- transmission of anaplasmosis by, 453.

Horsemint for honey production and for oil, Tex. 705.
Horses—
- blood pressure in, 71.
- breeding, treatise, 62.
- compounding rations for, 724.
- fatal disease of, 596.
- fistula and poll-evil, relation to *Bacterium abortus*, 168.
- in Philippines, temperature, pulse, and respiration rates, 168.
- intestinal parasites in, 169.
- on farms, Ind. 612.
- poisoning with ratti seeds, 745.

Horticulture enterprises in the South, 244.
Hotbeds—
- artificial illumination for, 609.
- coldframes, and propagating benches, electricity for, 329; Mass. 386.
- heating with electricity, Md. 524.

House flies in Palestine, biology, 285.
Household insects and pests, control, 428.
Houses—
- farm and village, foundations for, U.S.D.A. 350.
- five-room, size of rooms in, 350.
- insulation, economies and application, 782.
- ready-cut, five-room, size of rooms in, 350.

Humus, chemical nature, N.J. 505.
Hurricane grass, control, V.I. 518.
Hyalopterus arundinis, *see* Plum aphid, mealy.
Hyblaea puera, notes, 562.
Hybridization—*see also* Plant breeding *and specific plants*.
- interspecific and intergeneric, relation to plant breeding, 662.

Hydrangeas, flower color, factors affecting, 685.
Hydrocyanic acid—
- gas as fumigant for household insects, U.S.D.A. 428.
- gas concentration, relation to kill of scale insects, 711.

Hydrocyanic acid—Continued.
- producing plants, poisonous to livestock, U.S.D.A. 165.

Hydrometer for soil analysis, new type, 212.
Hydrophobia, *see* Rabies.
Hydroxyvaline, apparent dissociation constants, 197.
Hylemyia coarctata, epidemiology, 285.
Hylotrupes ligneus, notes, 579.
Hylurgops glabratus, notes, 426.
Hymenolepis carioca, notes, 746.
Hymenoptera, parasitic, larvae, respiration in, 443.
Hypera posticus, physical ecology, 719.
Hypcralonia oenomaus, notes, U.S.D.A. 582.
Hypercalcemia, irradiated ergosterol, source of excess calcium in, 487.
Hyphantria cunea, *see* Webworm, fall.
Hypocalcemia, artificially induced, in cows, 451.
Hypochlorites, corrosion from, lessening, 309.
Hypoderma—
- *lineatum*, *see* Cattle grubs.
- sp. larvae, toxin from, 451.

Hypoglycemia, artificially induced, in cows, 451.
Hypophysis—
- anterior lobe—
  - cyclic variation in capacity to induce ovulation, 120.
  - hormone and menstruation, 120.
  - hormones of, 232.
  - hormones, relation to prolan, 233.
  - of pigs, follicle-stimulating effect, 377.
- regulation by the testicle, 120.

Hystrignathus spp., notes, 282.
Ibalia leucospoides, biology and development, 721.
Ice cream—
- chocolate, studies, Mo. 448.
- curdled appearance when melting, causes, 595.
- dry and condensed skim milk for, 164.
- fat content, factors affecting, Iowa 209.
- maple, improving, 737.
- mixes, aged and unaged, freezing properties, 595.
- mixes and offbatches, standardizing, Wash.Col. 595.
- sandiness in, control, 69.
- studies, Calif. 593; Ind. 593; Mass. 447; N.J. 594; Nebr. 594.
- swell development, 309.
- texture, effect of total time of freezing, 164.

Ice making, treatise, 331.
Ice, use for cooling apples, Ind. 673.
Icerya purchasi, *see* Cottony cushion scale.
Ichneumonidae of South China, biology and classification, 285.
Ichthargan for treatment of piroplasmoses, 748.
Icterohemoglobinuria in sheep, Tex. 740.
Idaho—
- Station, notes, [illegible].

Idaho—Continued.
Station, publications available, 494.
University, notes, 95.
Idiocerus spp. on mango in Philippines, 707.
Illinoia—
pisi, *see* Pea aphids.
solanifolii, transmission of virus diseases by, Oreg. 696.
Immunity—*see also specific diseases.*
and bacteriology, principles, treatise, 738.
natural, and disease resistance, 311.
Imperial Bureau of Plant Genetics, bulletins, 518.
Incubation—
effects of automatic turning and positioning of eggs, N.J. 605.
electrical experiments, Calif. 588.
Incubators, formaldehyde fumigation, 460.
Index numbers of production, prices, and income, Mo. 470; Ohio 331, 470, 613.
Indiana Station—
Moses Fell Annex Farm, report, 782.
notes, 95.
report, 638.
Indian-meal moth, control, 287.
Indians, Maya, basal metabolism, 474.
Infants—*see also* Children.
deaths of and vitamin starvation, 88.
fecal flora, 772.
on undiluted milk, calcium and phosphorus metabolism, 340.
phosphorus metabolism, 470.
respiratory infections, relation to vitamin A, 482.
Infra-red radiations, injurious effects on plants, 386.
Inheritance, *see* Heredity.
Insect—
epidemics, periodicity, 285.
forecast for 1932 and recommendations for control, 560.
life, fundamentals, treatise, 422.
problems, 561.
Insecticides—*see also* Sprays, *and specific forms.*
analyses, Me. 674; N.J. 36.
and insect toxicology, Iowa 424.
contact, studies, N.H. 429, 560.
efficiency, relation to spreading and tracheal penetration, 565.
on shade trees and ornamentals, 566.
rôle in protecting fruit against coccids, 285.
spreading capacity, 285.
studies, N.J. 561.
toxicity and toxic value, 284, 285.
toxicity tests by hypodermic injection, 584.
use, Ohio 50.
waxes as carriers, 708.
Insects—*see also* Entomology.
affecting citrus, 47.
affecting grain and foods, nutrition and metabolism, Iowa 424.
affecting wild life, 450.
and climate, N.J. 560.
Insects—Continued.
and injuries from, treatise, 422.
attacking stored products, 287.
behavior, treatise, 280.
biological control, 287.
blood-sucking, in India, 708.
boring, control, N.J. 561.
chewing, infesting evergreens, Mich. 566.
classification, 423.
control by internal treatment of plants, 284.
control, effect of overhead sprinklers, 425.
control in orchards, 560.
control, new method, 561.
control problems and development in, 562.
control, science of, 285.
damage to teak timber, 287.
destructive, commercial use for, 50.
economic, in Arizona, 423.
effect of electromagnetic waves, 564.
forest, *see* Forest insects.
garden, *see* Garden insects *and* Truck crops.
immunity in, 423.
injurious in Indiana, Ind. 560.
injurious, in New York State, 427.
injurious to crops, see special crops.
new, in Utah, 427.
of Burma, 286.
of farm and garden, treatise, 149.
of Iceland, 425.
of India, catalogue, 287.
of Indiana for 1930, 50.
of Japan, illustrated account, 426.
of Japan, life histories, 286.
of Kenya, 426.
of Mauritius, 562.
of Mysore, 286.
of Ohio, 565.
of Puerto Rico and Virgin Islands, 573.
of Puerto Rico, initiation of survey, 706.
of Straits Settlements and Federated Malay States, 426.
of the Everglades, control, Fla. 559.
of Utah, 425.
plant-sucking, feeding punctures and effect on cotton, U.S.D.A. 288.
relation to alfalfa seed production, Utah 287.
respiration, 423.
scale, *see* Scale insects
soil, as carriers of hairy root disease, Wis. 690.
toxicity of stomach poisons to, 562.
International—
Conference on the Rat, 420.
Congress of Genetics, editorial, 497.
Intestinal—
permeability for bacteria, effect of vitamin A deficiency, 483.
worms in sheep and goats, control methods, comparison, 601.

Intestines, bacterial flora and pH value, effect of vitamin deficiency, 483.
Iodine—
and mercurochrome, germicidal value, 165.
effect on mosquito larvae, 55.
fed pregnant ewes, effect on offspring, Iowa 444.
in eggs, Ohio 58.
in Florida grown crops, Fla. 505.
in milk, Ohio 65.
occurrence, relation to endemic goiter in New Zealand, 487.
test for field corn, 208.
Iowa—
Beekeepers' Association, papers, 156.
College, notes, 351.
Station, report, 494.
Ipobracon rimac—
as sugarcane borer parasite, 715.
collecting in South America, 57.
Ipomoein from sweetpotatoes, 3.
Ips typographus, notes, 426.
Iris—
breeding, Tex. 673.
rhizome, morphological structure and reproduction, 261.
rust, studies, 556.
variety tests, Tex. 673.
Iron—
and copper for anemic infants, 485.
cast, alloyed, characteristics, 324.
distribution in plants, N.J. 508.
effect on citric acid fermentation of *Aspergillus niger*, 645.
in blood, determination, 105.
in diet of children, value, 484.
in protein foods, utilization, 185.
in vegetables and fruits, U.S.D.A. 85.
organic and inorganic, in hemoglobin formation, 479.
plus supplements, effect on hemoglobin regeneration, 346, 348.
requirement of preschool children, 475.
salts, different, relative effects on young rice, 23.
supplements in treatment and prevention of nutritional anemia, 346.
Irrigation—
canal structures, 751.
cost of pumping for, Colo. 173, 606.
effect on arid soil, 16.
efficiencies in, 322.
experiments—*see also special crops*.
relation to permanent wilting percentage, 322.
with crops, Can. 463.
for forage crops, Mont. 518.
hydraulics, standard symbols and glossary of terms, 750.
institutional, and drainage relations, 322.
of desert soils, Nev. 462.
orchard, sprinklers in, 175, 425.
projects, water shortages on, alleviating, 322.
Irrigation—Continued.
pump, power, and piping requirements, Mich. 463.
pumping plants, installation and operation, Idaho 463.
research, N.Mex. 76.
sewage, N.J. 605.
supplemental, 25 years of experiments, Oreg. 750.
v. dry farming under the ditch, 322.
Isoserine, apparent dissociation constants, 196.
Ittys new species, description, 443.
James Turner Research Institute, notes, 640.
Japanese beetle—
distribution, 577.
flight duration, 577.
growth curves, effect of temperature, 716.
in soil, hot water treatment, effect on plant roots, U.S.D.A. 56.
natural enemies in Far East, U.S.D.A. 582.
new towns infested, Conn.State 559.
repellency of extracts from immune plants to, U.S.D.A. 155.
situation in 1931, 565.
Japanese quince seedlings, characteristics, 37.
Jasmine withertip, notes, 47.
Jerusalem-artichokes—
fertilizer experiments, N.J. 517.
improvement, N.J. 517.
Johne's disease—
control and eradication, 454.
of cattle, intradermal test for, Ohio 69.
Johnson grass, control, N.Mex. 29.
Jujube anthracnose, notes, Tex. 555.
Kafir—
residue, effect on crop yields, 31.
Sunrise, seed selection in, 670
variety tests, U.S.D.A. 30.
Kale—
chemical composition, effect of seasonal temperatures, 131.
iron in, U.S.D.A. 85.
Kalimat B, value as disinfectant, 44.
Kamala—
anthelmintic value, 746.
for tapeworms in poultry, Ohio 69.
for tapeworms in turkeys, N.Dak. 730.
Kangaroo rat, burrowing on desert soils in Arizona, effect, 280.
Kansas College, notes, 639.
Kansas Station, notes, 639.
Kapok, new weevil pest, 426.
Katakilla, insecticidal value, 152.
Kawishiwi Experimental Forest, notes, 96.
Kellogg Institute of Animal Husbandry, notes, 95.
Kelp and fish meal v. cottonseed meal, feeding value, Ohio 65.
Kelp, feeding value, Ohio 58, 591.
Kentucky Station, notes, 639.
Keratin from decomposition of wool fiber as bait for blowflies, 575.

Keratins, basic amino acids in, 9.
Kerosene—
cook stoves, relation of draft to burner performance, Nebr. 637.
safe use and storage on the farm, U.S.D.A. 174.
Kidney worm in pigs, 74, 456, 602.
Kitchen—
arrangements, rural, Ind. 637.
equipment, standard measurements proposed, 350.
storage equipment, standard design proposed, 350.
Kodra smut in India, 403.
Kraco, feeding value, N.J. 591.
Kudzu as forage crop, U.S.D.A. 380.
Kuehneola fici, notes, 265.
Kumquats, variety tests, Tex. 673.
Lactation—
and fertility, dietary requirements, 484.
in small animals, technic for studying, 770.
Lactic acid—
apparatus, improved, 202.
titration in presence of ferric and cupric salts, 203.
Lactobacillus acidophilus cultures, effect of acidity, 307.
Lactobacillus genus, survey, 769.
Lactose in milk, effect of unequal intervals between milkings, 733.
Lady beetle, 13-spotted, hibernation, 50.
Laelius anthrenivorus, parasite of *Anthrenus verbasci*, 57.
Lagena radicicola n.g. and n.sp., description, 140.
Lake Michigan, effect on east and west shore climates, U.S.D.A. 10.
Lamb dysentery bacillus, studies, 73.
Lambs—see also Sheep.
crossbred, gains in weight and wool production, Wyo. 59.
crossbreeding studies, 158.
Easter, raising, Ohio 58.
ewe, breeding, N.Dak. 722.
fattening, Ind. 588; Nebr. 589; Tex. 723.
fattening, cost, Mich. 446.
feeding and carcass tests, 158.
feeding and finishing, Nev. 445.
feeding experiments, Nebr. 298; Wyo. 59.
feeding, mixing hay with grain for, Wis. 723.
intestinal tube, bacterial flora, 456.
New Mexico range, fattening rations, N.Mex. 298.
sextuplet, 232.
spring, production, Calif. 588; La. 295.
stiff, cause, 745.
stomach worms in, treatment, Ind. 596.
Land—see also Farm lands.
credit, see Agricultural credit.
forest, see Forest.
grant colleges, see Agricultural colleges.
Land—Continued.
marginal, economic utilization, U.S.D.A. 614.
plaster, see Gypsum.
recreational, need for, Wis. 759.
submarginal, problems, U.S.D.A. 614.
utilization—
economic, for pasture, Ind. 758.
in Laurel County, Kentucky, U.S.D.A. 179.
national conference on, proceedings, U.S.D.A. 618.
research in, 179.
Laphygma exempta, new pest of rice and corn, 435.
Larch—
longhorn beetle, parasites of, biology, 584.
properties, relation to uses of wood, U.S.D.A. 263.
seed beds, damping-off in, effect of superphosphate, 41.
Lark, prairie horned, life history and habits, 422.
Larkspur, breeding, Calif. 525.
Laryngotracheitis—
acute avian, blood cell counts, 747.
in fowls, 450.
infectious—
and feeding of moldy corn, Mass. 457.
etiology, 459; Calif. 595.
of chicks, N.Dak. 739.
of fowls, N.J. 602.
of fowls in Germany, 321.
susceptibility of pheasants and pheasant bantam cross, 321.
virus, infection of cloaca of fowls with, 747.
Lasioderma serricorne, see Tobacco beetle.
Lasiosina cinctipes, bionomics, 716.
Laspeyresia molesta, see Peach moth, oriental.
Laundering effect on durability of cotton fabrics, Mo. 493.
Lawns—
establishment, Ohio 517.
fertilization and management, Mass. 378; Ohio 517.
fertilizer requirements, R.I. 233.
Lead—
arsenate—
acid, and oil emulsions, compatibility, 425.
and nicotine tannate as codling moth poisons, 713.
and summer oil, Calif. 559.
for codling moth control, factors limiting, 283.
sprays, use of hydrates in, reactions, 288.
substitutes for sprays, Ind. 523.
toxicity, factors affecting, 562.
atmospheric corrosion, 464.
Leaf—
extracts, reaction, and disease susceptibility, 401.

Leaf—Continued.
roller, three-lined, life history and habits, 571.
rollers, control, Calif. 559.
Leafhopper—
blunt-nosed, control, N.J. 561.
six-spotted, vector of onion yellow dwarf, 432.
Leafhoppers—*see also special hosts.*
new mermithid worm parasitic on, 710.
on mango in Philippines, 707.
response to colored lights, 568.
Leaves—
change of substances in during vegetation, 372.
water supply of epidermis, 508.
Lecanium scale, oil emulsion spray for, 425.
Leeches—
rôle in rinderpest transmission, 315.
transmission of surra by, 743.
Leek leaf beetle in south Manchuria, life history, 293.
Leeks, vitamin B (B_1) in, 634.
Legume inoculants, inspection, N.J. 35.
Legumes—*see also* Green manure *and* Alfalfa, Clover, *etc.*
and grains in combinations, variety tests, Mich. 31.
as green manure for potatoes, La. 233.
for green manure, Iowa 378.
for hay and pasture, tests, Iowa 378.
inoculation, N.C. 666.
nurse crops for, Iowa 378.
resistance to homopterous insects, 53.
use on neglected hay lands, N.H. 505.
variety tests, La. 233; Tex. 668.
winter, variety tests, Miss. 29.
Lemon—
die-back, experimental reproduction, 279.
oil, analyses and composition, U.S.D.A. 100.
scab, control, 417.
trees, declined, effect of inarching, 532.
Lemons—
culture, U.S.D.A. 35.
pink-fruited, description, 260.
studies, Calif. 526.
variety tests, Tex. 673.
Leopard moth, notes, N.J. 560.
Lepidiota pruinosa, notes, 562.
Lepidoptera—
female reproductive organs, 284.
of California, 423.
Lepidosaphes ulmi, see Oyster-shell scale.
Leptinotarsa decemlineata, see Potato beetle, Colorado.
Leptocryptus bellulus, notes, 157.
Leptosphaeria herpotrichoides, notes, 268, 542.
Leptosphaeria sacchari, notes, 265.
Leptosphaeria spp., notes, 400, 694.
Leptothyrium zeae, notes, 694.
Lespedeza—
Korean and Japanese, value for pastures, Ohio 239.
Lespedeza—Continued.
Korean, characteristics, adaptation, and cultural needs, Kans. 239.
variety tests, Tex. 668.
Lettuce—
bottom rot, control, N.Y.Cornell 44.
breeding, Hawaii 385.
brown blight disease, 269.
copper and manganese in, relation to mineral additions to soil, 775.
culture, U.S.D.A. 35.
fertilizer experiments, Ill. 36.
growth and soil reaction, relation, 37.
head, production, N.H. 676.
Iceberg, culture, N.H. 524.
inheritance of heading characteristics, 248.
inner and outer leaves, vitamins in, 88.
respiration rate, 675.
variety tests, Conn.State 523.
Leuconostoc and Streptococcus species, differentiation, N.Y.State 224.
Leucopholis irrorata—
biology and control, 155.
notes, 439, 562.
Leucopis obscura, notes, 285.
Leucosis of fowls, 321, 747.
Leucostoma leucostoma and *Valsa japonica,* comparison, 145.
Leukemia in fowls, 747; Mo. 457.
Leukemia, myeloblastic, 596.
Levulose properties and determination, 208.
Light—*see also* Sunlight.
artificial, effect on egg production, Ohio 58; Wyo. 59.
artificial, effect on plant growth, 659.
box for photographing diseased fruits, 374.
colored, response of leafhoppers to, 568.
importance in germination, 509.
intensities, effect on growth in virgin Norway pine forest, 262.
therapy, present status, 492.
Lignin—
determination in plant materials, 206.
relation to cellulose in wood, 646.
Ligyrus rugiceps, see Sugarcane beetle.
Lilies-of-the-valley, forcing, U.S.D.A. 398.
Lilium genus, hybridity in, 514.
Lily—
disease investigation fellowship, 417.
diseases in United States, 418.
mosaic, notes, 417.
Lima beans, *see* Beans, Lima.
Lime—*see also Calcium and Liming.*
analyses, N.J. 115.
effect on soil reaction, 658.
kinds and amounts, effect on Iowa soils, Iowa 113.
phosphate, value on dairy farms, Wis. 657.
products, inspection, Mass. 114.
requirements of soils, *see* Soils.
Lime (fruit)—
twigs and fruit, canker on, 264.

Lime (fruit)—Continued.
    twigs, *Meliola butleri* on, 265.
    withertip disease, notes, 399, 400.
Limestone, value in crop rotations, Va. 668.
Lime-sulfur—
    and sulfur dusts, fungicidal value, 540.
    substitute for summer spraying, 600.
Liming, effect on apple trees, 250.
Linkage—
    in size inheritance, 231.
    relations in corn of glossy character, 119.
Lipemia, vitamin B (B_1), v. inanition lipemia in lactating rats and young, 486.
Lipids, plasma, in lactating and nonlactating animals, 304.
Liponyssus bacoti, vectors of endemic typhus, 282.
Lissorhoptrus simplex, *see* Rice water weevil.
Listronotus—
    latiusculus, notes, 579.
    rudipennis, notes, 579.
Lithiasis, urinary, in cattle, 596.
Liver—
    disease, enzootic, of equines in South Africa, 70.
    extracts, oxidation capacity, 482.
    extracts, vitamin B (B_1) and G (B_2) in, 187.
    fluke, control, 450.
    fluke in rabbits, longevity, 605.
    of dog, carotenase in, 647.
    oils, antimony trichloride and ultraviolet absorption tests, 102.
    oils, chromogenic constituents, new conception, 341.
    tribasic acid in, 199.
Livestock—*see also* Animals, Mammals, Cattle, Sheep, *etc.*
    breeding, Iowa 444.
    breeds in America, 58.
    disease, new, in Matto Grosso, 453.
    diseases, *see* Animal diseases *and specific diseases.*
    feeding and nutrition experiments, Ohio, 58.
    feeding with fish meal, 59.
    feeding with rice and by-products, U.S.D.A. 59.
    improvement in Europe, methods, 445.
    marketing and trucking, statistics, Iowa 763.
    marketing, cost by truck and rail, Mo. 334.
    number per acre, Ind. 613.
    poisoning—*see also* Plants, poisonous, *and specific plants.*
        by plants producing hydrocyanic acid, U.S.D.A. 165.
    possibilities in Red River Valley, Minn. 758.
    production on Newlands project, Nev. 471.
    shipments and prices, Iowa 470.
    shipping associations, cooperative, efficiency, W.Va. 619.
Living, standard of, *see* Standards.
Lizards—
    of Utah, insect food, 425.
    predators of leafhopper, 569.
Loco weed poisoning, Tex. 740.
Locust borer, new sprays effective, 717.
Locusts—
    control in Punjab, 286.
    migratory—
        in the Gold Coast, 430.
        invasion of Kenya and control, 430.
        periods of outbreaks, 562.
        poison dust experiments for, 429.
Loganberry beetle, control, 284.
Logs and stumpage, prices for 1930, U.S.D.A. 137.
Loin disease of cattle, Tex. 740.
Loranthaceae outbreak on bamboo, 557.
Loranthus europaeus, host range and extension to *Castanea vesca*, 48.
Loranthus sp., notes, 47.
Louisiana—
    Rice Station, report, 350.
    Station, Fruit and Truck, report, 191.
    Station, North, report, 191.
    Stations, notes, 640.
    Stations, report, 350.
Louping-ill—
    etiology, 167.
    histopathology, 598.
    of sheep, transmission to mice and monkeys, 71.
    studies, 744.
Love grass leaf blight, cause, 269.
Lubricants and fuels, survey, 325.
Lucern, *see* Alfalfa.
Lucilia—
    caesar, notes, 596.
    sericata for treatment of osteomyelitis, 437.
    sericata on sheep in Queensland, 154.
Lumber—*see also* Timbers *and* Wood.
    and uses, treatise, 399.
Lumpy jaw, *see* Actinomycosis.
Lung fluke in North America, 585.
Lung worms of sheep, treatment, 601.
Lutein and oestrin combinations, effect on uterus of mice, 232.
Lycopersicum, trisomic inheritance in, Calif. 512.
Lye as barn disinfectant, Wis. 740.
Lygaeus hospes, life history notes, 709.
Lygus—
    pabulinus on black currants, control, 284.
    pratensis, *see* Tarnished plant bug.
    simonyi, coffee pest in Kenya, 431.
Lymantria monacha, notes, 426.
Lymphadenitis, caseous, of sheep in Australia, 600.
Lymphangitis, epizootic, mycelial forms of parasite, 743.
Lymphomatosis of *fowls, various forms*, Va. 747.
Lyperosia exigua, biology and control, 576.
Lysimeter studies, N.Y.State 220.

Machinery, *see* Agricultural machinery.
Macracanthorhynchus hirudinaceus of swine, P.R. 597.
Macracis monhystera, notes, 282.
Macrobracon hebetor, biology, 425.
Macrocentrus—
    ancylivorus, notes, 442, 571; Conn. State 559; N.Y.State 441; Ohio 50.
    delicatus, notes, 443.
Macrophoma pachysandrae n.sp., description, 402.
Macrosiagon pusillum, notes, U.S.D.A. 582.
Macrosiphum matsumuraeanum, biological studies, 286.
Macrosiphum solanifolii, *see* Potato aphids.
Macrosporium solani, notes, 407.
Macrosporium sp. on onion and garlic, 265.
Magnesium—
    feeding of plants via leaves with, 22.
    requirements of crops, Mass. 367.
    salts, effect on solubility of bone calcium, 109.
Maize, *see* Corn.
Malacosoma americana, *see* Tent caterpillar, eastern.
Malaria, *see Mosquitoes and Anopheles*.
Male raggiante, use of term, 414.
Malic acid, titration in presence of ferric and cupric salts, 203.
Mallophaga, new genera and species, 70.
Malnutrition, recovery from, growth and retention of minerals, 189.
Malt extracts, proteolytic enzymes of, 358.
Malt flavor in raw milk, cause, 66.
Malta fever, *see* Undulant fever.
Mamey apple, propagation, Hawaii, 385.
Mammals—*see also* Animals *and specific kinds*.
    as host for chiggers and other ectoparasites, 49.
    hibernation, 148.
    of New Mexico, U.S.D.A. 148.
    reproductive processes, 121.
    secondary poisoning, 281.
Mammary glands, studies, Mo. 377.
Mammitis, *see* Mastitis.
Man, insects and pests affecting health, 566.
Manamar—
    effect on milk production, Ohio 65.
    feeding value, N.J. 591; Ohio 303.
Manganese—
    in nutrition, Wis. 769.
    in plants, distribution and value, 118.
    metabolism studies, technic, 91.
Mange, demodectic, in cattle, 744.
Mangels—
    culture experiments, 123.
    effect of mass selection, 228.
    fertilizer experiments, 123.
    types, tests, 31.
    variety tests, 31.
Mango anthracnose in Philippines, 707.
Mangoes—
    fertilizer experiments, P.R. 525.
    spraying experiments, 400.
Manila hemp, *see* Abaca.
Mannite utilization by Azotobacter, Mass. 367.
Manure—
    disposal on poultry ranch, 450.
    effect on microbiological activities in virgin peat, 221.
    substitutes in greenhouses, Ind. 523.
Maple—
    flavor, source for ice cream, 737.
    leaves, fungus affecting, 557.
    sugar, tolerance to insecticides, 566.
Marasmius—
    palmivorus, notes, 400.
    perniciosus, notes, 399.
    sp., notes, 264, 400.
Marigolds, injury from potato leafhopper, 568.
Market gardens, *see* Truck crops.
Market reports, U.S.D.A. 182, 619, 766.
Marketing—*see also special products*.
    agricultural products, treatise, 384.
Marsh soils, acidity and base-exchange in, Wis. 657.
Maryland Station, report, 638.
Maryland University, notes, 95, 783.
Massachusetts College, notes, 192.
Massachusetts Station, report, 494.
Mastitis—
    bovine, cause, 167.
    diagnosis and control, 312, 313.
    studies, 599.
    studies in Quebec, results, 313.
Materials, A.S.T.M. tentative standards, 78.
Materials of construction, *see* Building.
Matthiola, trisomic inheritance in, Calif. 512.
Mayetiola—
    destructor, *see* Hessian fly.
    phalaris, parasites of, 285.
Meadow mixtures, tests, W.Va. 666.
Meadows—*see also* Grasses *and* Pastures.
    improvement, Nebr. 517.
Mealybug—
    catalpa, notes, 565.
    citrophilus, control, Calif. 482.
    citrophilus, imported parasites, Calif. 559.
    citrus, on greenhouse plants, 558.
    on papaya fruit, new parasite of, 57.
    pink, on sugarcane, 53, 562.
Mealybugs—
    control, N.J. 561.
    in insectaries, Aspergillus affecting, 265.
    notes, Fla. 559.
Meat—*see also* Beef, Pork, *etc.*
    cookery problems, N.Dak. 770.
    diets, prolonged, effects, 87.
    nutritional properties, Mo. 474.
Mediterranean fever, *see* Undulant fever.
Megaselia plurispinulosa, notes, 285.
Melanocallis fumipennella, notes, Fla. 559.
Melanoplus—
    bivittatus, *see* Grasshopper, two-striped.

Melanoplus—Continued.
differentialis, see Grasshopper, differential.
mexicanus mexicanus, increase in western Canada, 283.
Melanosis in cattle, 743.
Meliola butleri on lime twigs, notes, 265.
Melon aphid as pest of watermelons, Fla. 559.
Melons—
disease resistant, breeding and selection, Iowa 399.
insect pests, Mo. 424.
variety tests, Tex. 673.
wilt-resistant, morphology and cytology, Iowa 399.
Mendel anniversary, critical reviews in nutrition research, 769.
Menhaden fish meal, feeding value for pigs, Ohio 591.
Menstruation and hormone of anterior lobe of hypophysis in monkeys, 120.
Mercurochrome and tincture of iodine, germicidal value, 165.
Mercury and copper, specific action as plant poisons, 540.
Meromyza saltatrix, bionomics, 716.
Merulius lacrymans, oxidases in, 49.
Mesonin, a third protein in gluten, Nebr. 500.
Metabolism—
basal—
in diabetic children, 487.
of children before and during early puberty, 476.
of Europeans in Tropics during rest, 474.
of Maya Indians in Yucatan, 474.
of women over thirty-five, 87.
relation to body weight, Mo. 586, 626.
of Eskimos, studies, 87.
Metals, atmospheric corrosion, 464.
Metals, effect on milk, Calif. 593.
Metals, solubility in milk, 67, 735.
Metaphen, effect on agglutinin titer in abortion disease of cows, 72.
Meteorological—
calculus: pressure and wind, 210.
conditions, effect on growth of Punjab-American cotton, 238.
conditions preceding frost, 107.
observations, Fla. 633; La. 191; Mass. 210, 654; R.I. 850; U.S.D.A. 11, 107, 366, 654; Wyo. 12.
at Big Spring, Tex., field station, U.S.D.A. 30.
at Sacaton, Ariz., U.S.D.A. 11.
service of India, formulas used in, 210.
Meteorology—*see also* Climate, Rainfall, Temperature, Weather, *etc.*
and forest fire problem, U.S.D.A. 11.
manual, 210.
papers on, U.S.D.A. 11, 366.
textbook, 654.
Methanes, optically active trisubstituted containing phenyl group, 193.
Methionine, apparent dissociation constants, 196.
Methoxyl—
determination in plant materials, 206.
group, determination, 206.
Methylglyoxal, color and precipitation reactions, 100.
Methylglyoxal, determination, 100.
Mice—*see also* Rodents.
as pests of watermelons, Fla. 559.
blood of, studies, 70.
hybrids with different numbers of tail rings, 377.
new mutation to dominant spotting, 376.
vitamin B requirement, 684.
Michigan Station, quarterly bulletin, 494.
Microbracon—
hebetor, parasite of *Ephestia elutella*, 712.
tachypteri, notes, Colo. 719.
terebella, notes, 157.
Microcalliphora varipes on sheep in Queensland, 154.
Micrococcus ulmi, notes, 48.
Microcryptus unifasciatus, notes, 157.
Microfilariasis, equine, review of literature, 745.
Microlepidoptera, biology and host plant list, 715.
Microorganisms—*see also* Bacteria *and* Organisms.
metabolic products, action on host plants, 538.
of Malayan soils, 401.
pathogenic, handbook, 738.
rôle in decomposition of organic matter, N.J. 505.
Microphanurus megacephalus, egg parasite of southern green stinkbug, 442.
Microscope, use, handbook, 201.
Microscope-centrifuge and applications, 651.
Microscopy, practical, treatise, 202.
Midas pygmaeus, habits, Calif. 432.
Mildew, *see host plants*.
Milk—
abnormal flavors in, Mich. 66.
acidophilus, antirachitic effect, La. 845.
acidophilus, production, 737.
and soybean milk, dietary properties, comparison, 481.
as source of vitamin B complex, 159.
bacteria in, methods of estimating, 162.
bacterial count, effect of milk plant practices, U.S.D.A. 734.
boiled, vitamin B (B_1) in, 779.
certified, conferences held in 1931, 165.
coagulability, Calif. 593.
concentrated water-soluble portion, vitamin B complex in, 187.
condensed and dried, summary of information, 736.
cooling on Nebraska farms, Nebr. 305.
cooling unit, portable-type ice-refrigerated, Calif. 605.
digestibility, effect of curd tension, 477.

Milk—Continued.
dried, difference in peptic digestion of proteins, 737.
factor, new, in various foods, 186.
feed flavor detection, minimum time, Calif. 593.
fever, cause, Wis. 731.
fever, experiments with calcium therapy, 314.
fever, studies, 167, 451.
flavor development in, relation to plant processes, 307.
food value, effect of high and low protein rations, *Ohio* 65.
freezing, effect on food value, Md. 594.
germicidal properties, Iowa 447.
handling, 733.
human, fresh pooled, vitamin G (B_2) in, 624.
human, nutrients in, relation to diet, 624.
human, nutritive aspects, 769.
human, psychological and physiological data on production, 625.
human, studies, 623, 624.
in diet of young children, Ohio 622.
inheritance, contribution of dam in, 66.
iodine in, Ohio 65.
iodized, effect on growth of calves, *Ohio* 65.
irradiated, antirachitic and calcifying potency, 489.
irradiated, vitamin D in and rate of formation, 490.
malt flavor in, cause, 66.
market, analysis of farm sales to dealers, *Ohio* 83.
market of Milwaukee, Wis. 334.
marketing, quality factor in, N.Y. State 765.
marketing situation in 1931, Mich. 471.
metals in, corrosion tests, 735.
narcotine in, 649.
nutrition factors other than vitamins, 186.
of foxes, composition, 65.
pasteurization—
and cooling in the vat, N.Y.State 306.
efficiencies from individual farms, Iowa 306.
temperatures, effect on *Brucella abortus* in, 71.
pasteurized—
by holder process, thermophilic bacteria in, N.Y.State 306.
thermophilic bacteria in, significance, N.Y.State 734.
pasteurizing plants, construction, equipment, and arrangement, U.S.D.A. 178.
plants, breakage of bottles in, factors affecting, U.S.D.A. 67.
precooling, N.H. 595.
production—
effect of age at first calving, Mo. 304.

Milk—Continued.
production—continued.
effect of use of fly repellent, N.J. 594.
relation to method of watering, U.S.D.A. 65.
source of protein for, Iowa 447.
protein-free, vitamin G (B_2) in, factors affecting, Mich. 359.
rate of digestion, effect of physical properties, Iowa 447.
raw, germicidal action on organism of sweet curdling type, 307.
ropy and bitter organisms, destruction *by hypochlorite*, 162.
ropy, organisms, feeds as source, 595.
sampling for fat test at milk plants, N.Y.State 305.
skimmed, *see* Skim milk.
soft-curd, 477.
solubility of metals in, 67.
sugar as aid in mineral absorption, Wis. 723.
supply, eastern Nebraska, seven-year study, Nebr. 449.
sweetened condensed, abnormal thickening, Wis. 731.
testers, manual, N.J. 449.
titratable acidity, N.J. 594.
vitamin A in, Nebr. 594.
vitamin B (B_1) in, effect of rations, *Ohio* 65.
vitamin D in, effect of exposure to sunshine, S.Dak. 65.
vitamin D in, effect of irradiated ergosterol, Ohio 65.
vitamin D in, increasing, Ohio 448.
vitamin D potency, S.Dak. 58.
vitamins in throughout the year, 159.
Milkweed—
fibers, characteristics and textile values, 93.
whorled, poisonous for poultry, 450.
Millet—
as hay crop, N.J. 379.
Italian, inheritance of characters in, 25.
Japanese and barnyard grass, 235.
smut in India, 403.
variety tests, Fla. 516; N.Dak. 667; N.Mex. 29; Wyo. 31.
Milo—
for grain, U.S.D.A. 30.
residue, effect on crop yields, 31.
tillering in, Tex. 668.
variety tests, U.S.D.A. 30.
Mineola vaccinii, *see* Cranberry fruit worm.
Mineral—
content of intensively treated pasture, 297.
elements, traces in animal body, significance, 769.
oils for improvement of dusts, 563.
resources of country as related to farm lands, 331.
Minerals—
for pigs, 299.

Minerals—Continued.
nonmetallic, and products, standards and specifications, 465.
Mines, *Armillaria mellea* in, 280.
Minnesota Station, notes, 95, 351, 783.
Minnesota University, notes, 95, 351.
Mississippi—
College, notes, 96.
Station, notes, 640.
Station, South Branch, report, 94.
Missouri Station report, 494.
Mites—
in poultry houses, control, La. 283, 313.
on Ardisia plants, N.J. 561.
orchard, control, 283.
redberry on blackberry, 425.
spinning, new on raspberry in Michigan, 443.
Mohair—
growth studies, Tex. 723.
industry in Texas, Tex. 333.
Texas, grades and shrinkages, Tex. 723.
Moisture penetration in exterior walls, 464.
Molasses—
blackstrap, feeding value, La. 295.
feeding value, N.Mex. 298.
for fattening lambs, Ohio 58.
Molds—
effect on temperature of stored grain, 662.
in butter, churn as source, 68.
in butter, determination methods, 162.
in respiratory tract of chickens, 746.
on rice seeds and seedlings, 267.
Moles, control in Iowa, Iowa 704.
Moniezia expansa in sheep and goats, *control,* 602.
Monilopsis—
aderholdi, biology, 417.
klebahni on conifer seedlings, 690.
Monkeys, effect of vitamin withdrawal, 777.
Monochaetia desmazierii, studies, 418.
Moor soils—*see also* Peat soils.
horticulture upon, 130.
Mosaic—*see also specific host plants.*
disease virus, inactivation by pulverizing infected tissue, 696.
diseases, effect on cell structure and on chloroplasts, 137.
Mosquitoes—*see also* Anopheles, Malaria, *and* Yellow fever.
anopheline, of China, 715.
control, Conn.State 559.
control, airplane oiling for, 574.
culicine, winter breeding and activity at New Orleans, 55.
effect of poisons on, 55.
in Philippines, daytime resting places, 201.
larvae, development, importance of pH, 285.
larvicides, charcoal as diluent for dust sprays, 715.
of Adirondacks, 716.
studies, N.J. 560.
transported by airplanes, staining method of determining, 436.
Moth—
oecophorid, attacking book bindings, 289.
pest of wheat and oats, 714.
Moths—
house, studies, 573.
of Puerto Rico, 573.
Motor—
and aviation fuels, volatility, 465.
trucks, factor in farm freighting, U.S.D.A. 77.
Mowing machines—
draft tests, 327.
value of oil bath construction, 176.
Muck and sand fill, stabilization by drainage, U.S.D.A. 608.
Muck soils, chemical composition, N.Y.Cornell 214.
Mulberry leaf, variations of chlorophyll in, 661.
Mulberry trees in nursery, effect on defoliation and pinching back, 581.
Mules—
feeding and nutrition studies, La. 294.
intestinal parasites in, 109.
Musca domestica, see House flies.
Muscle extractives, nitrogenous, 769.
Mushrooms—
edible, vitamins in, 629.
insects affecting, 565.
new truffle in beds of, 695.
nutrition, N.J. 505.
Muskmelon downy mildew, Tex. 690.
Muskmelons—
breeding, Calif. 525; N.H. 524; Tex. 673.
correlation studies, 247.
culture, U.S.D.A. 35.
Muskrats—
food in summer, 420.
new host for Paragonimus, 585.
Mustard—
greens, California, composition and time for cooking, 770.
greens, iron in, U.S.D.A. 85.
variety tests, Tex. 673.
Mutations, heat-induced chlorophyll in corn, 226.
Mutton qualities in sheep, 298.
Myasis in silver black fox, 596.
Mycobacterium tuberculosis, notes, 316.
Mycorrhiza—
formation, studies, 512.
in cranberry cultures, effect, 40.
Mycorrhizas, relation to conifer seedlings, 373.
Mycosis of turkeys, 749.
caryigena n.comb., notes, 147.
Mycosphaerella—
pomi, notes, 412.
zeicola, notes, 694.
Myelois venipars, notes, 423.
Myzocallis discolor coloradensis n.v., description, 53.
Myzus persicae, see Peach aphid, green.
Myzus spp., transmission of virus diseases by, Oreg. 696.

Nabis ferus, predator of beet leafhopper, 569.
Naphthalene as fumigant for greenhouse pests, Mass. 424.
Naphthoresorcinol, reaction with alduronic acids, 104.
Narcissus—
basal rot, control, Miss. 147.
bulbs, basal rot due to *Fusarium* sp., 556.
bulbs, basal rot, relation to hot-water treatment, 556.
culture, treatise, 261.
Narcotine—
and derivatives as antiscorbutics, 648.
as precursor of vitamin C, 648.
isolation from vegetables, 649.
Nasal granuloma, bovine, 451.
National—
Conference on Land Utilization, proceedings, U.S.D.A. 613.
Institute of Agricultural Botany, variety trials, methods, 31.
Naval stores practices, experiments in, U.S.D.A. 535.
Nebraska Station, notes, 495, 783.
Nebraska Station, report, 638.
Necrology, notes, 351.
Nectarines—
carotenoid content, relation to light, 245.
studies, Calif. 526.
Nectria canker, infection, 43.
Nectria spp., oxidases in, 49.
Negroes, agricultural education among, status, U.S.D.A. 336.
Nematode—
eggs and larvae, development in cattle dung, 70.
scab of potatoes, 407.
Nematodes—*see also* Root knot nematode.
affecting cotton roots, 406.
affecting potatoes in Great Britain, 408.
affecting potatoes in Sweden, 408.
beet and oat, identity, 694.
beet, stimulational physiology, 693.
histological studies, 282.
in citrus groves, Calif. 535.
in greenhouse soils, eradication, Mass. 399.
in sheep, diagnosis, 70.
transmission via seed, 558.
Nematodirus helvetianus in calves, 317.
Nematospora sp., notes, 702.
Neodiprion—
burkei in Yellowstone National Park, U.S.D.A. 707.
burkei n.sp., description, 441.
rohweri n.sp., description, 441.
swainei n.sp., description, 441.
Neomaskellia bergi, notes, 562.
Neomyzaphis abietina, injury to spruce, 569.
Neoplasms of domestic animals, 310.
Nephelometer for measuring growth of bacteria, 374.
Nephritis of chicks, ataxia associated with, 748.
Nessberry, breeding, chromosome behavior as factor, 682.
Neurolymphomatosis in fowls, pathogenesis, 458.
Neuropsora crassa, resistance of, 689.
Nevada Station, notes, 495.
Nevada Station, report, 494.
New Hampshire Station, report, 638.
New Jersey Stations, notes, 640.
New Jersey Stations, report, 638.
New Mexico Station, report, 94.
New York Cornell Station, notes, 640.
New York State Station, noes, 96, 495, 783.
Nezara viridula, *see* Stinkbug, southern green.
Nicandra physalodes, utilization, 384.
Nickel, atmospheric corrosion, 464.
Nicotiana—
alata grandiflora, somatic chromosomes and nondisjunction in, 224.
digluta synthetic species hybrids with parents *glutinosa* and *tabacum*, 375.
paniculata-rustica hybrid, 376.
sylvestris-tomentosa-tabacum hybrid triangle, 376.
tabacum haploids, diploidy and partial diploidy in root tips, 224.
Nicotiana—
chromosome number and morphology, 224.
haploid and diploid merogony, 376.
hybrid, heteroploid progeny, 225.
interspecific hybridization in, 375, 376.
Nicotine—
for control of avian coccidiosis, Ohio 69.
sulfate and barium fluosilicate, apparent incompatibility, 49.
sulfate and barium fluosilicate, incompatibility, 558.
tannate and lead arsenate as codling moth poisons, 718.
toxicity to red spider, 722.
volatility, 100.
Nilaparvata oryzae, new parasite of, 710.
Nitrate of potash, *see* Potassium nitrate.
Nitrate of soda, *see* Sodium nitrate.
Nitrates—
accumulation and movement in soil, Okla. 368.
accumulation under various treatments, 218.
determination, 362.
determination by electrolytic reduction, 361.
in plants, field tests, 362.
in soil, Mass. 367.
in soil, effect of cultivation methods, Ark. 368.
in soil, effect of green manure, 17.
in soils with soluble organic matter, determination, 204.
Nitrification—
activity in fall and winter, 668.

Nitrification—Continued.
in soils of India, effect of alkali salts, 218.
Nitrogen—
assimilation by pure cultures of anaerobic bacteria, 118.
availability in fertilizers, N.J. 507.
carriers for turf grasses, comparison, Ohio 29.
concentration in peach twigs under sandhills conditions, 529.
determination in tissues, effect of trichloracetic acid, 205.
determination, iodometric and manometric, 104.
determination, use of selenium oxychloride in, 208.
equilibrium on low protein diet, 478.
fixation—
and dextrose metabolism, 118
by Azotobacter, effect of temperature, 112.
in presence and absence of legumes, Mass. 367.
periodism and effect of inoculation with Azotobacter, 658.
in golf green clippings, Mass. 367.
in green manure, N.J. 507.
metabolism in rats, effect of irradiated ergosterol in large doses, 89.
outlook, 222.
relation to fruiting of cotton, Ark. 669.
relation to potassium in nutrition of fruit trees, 133.
research with tomato plants, N.J. 505.
sources for cotton, comparison, Miss. 29.
time of applying to apple trees, 390.
Nitrogenous fertilizers—
concentrated, effect on permanent soil acidity, 658.
effect on small grains after sorghum, 667.
effect on storage behavior of apples, 391.
for tobacco, Conn.State 383.
relative efficiency, Ind. 505.
Nodule bacteria—*see also* Legumes, inoculation.
studies, Wis. 657.
North Carolina College, notes, 784.
North Carolina Station, notes, 784.
North Dakota Station, report, 782.
Nudaurelia cytherea pupae, toxicity, 70.
Numidica suricattae, notes, 70.
Nursery—
diseases, control, Iowa 399.
studies, Ind. 533.
trees, variety certification, 249.
Nut case bearer, notes, Fla. 559.
Nutrient solutions—
acid, antagonism in, 223.
concentration, effect on pH requirement for plant growth, 22.
Nutrients, sources during pregnancy, lactation, and reproductive rest, 475.
Nutrition—*see also* Diet.
and diet in health and disease, treatise, 337.
animal, *see* Animal nutrition.
experiment, good, essentials, 183.
research, critical reviews for Mendel anniversary, 769.
studies, 186; N.H. 587; Wis. 769.
Nutritional—
disease, 596.
research, applicability of statistical treatment, 472.
Nuts—
insects affecting, Fla. 559.
phenological and variety tests, N.Mex. 35.
propagation, Mo. 386; R.I. 244.
structure and composition, 472.
Nysius ericae, *see* Chinch bug, false.
Oak—
large leaf spot, studies, 418.
roots, *Conopholis americana* affecting, 557.
tortrix in Pieve forests, 285.
Oat—
crown rust, studies, Iowa 399.
feed and timothy hay for dairy cows, Wis. 731.
feed as substitute for roughage, Md. 732.
leaf stripe in Scotland, 543.
smut—*see also* Cereal smuts.
notes, 692; Calif. 535; Wis. 690.
specialized races, 139.
stem rust in Mississippi Valley, relation to weather, 541.
straw, breaking strength, 670.
Oats—
amino acid deficiencies, for growth in rats, 627.
and barley mixtures, tests, Ohio 517.
anthesis under Australian conditions, 239.
behavior in grinding, 177.
breeding, Mo. 378; Tex. 668.
culture experiments, Iowa 378; La. 123; Ohio 517.
fatuoid and other aberrant types in, 662.
feeding to lambs, Ind. 588.
feeding to pigs on red clover pasture, Ohio 592.
feeding value, Tex. 723.
feeding value for laying hens, Ohio 58.
fertilizer experiments, 123; Fla. 516; La. 123; Nebr. 517; Tex. 668; Wyo. 31.
for fattening cattle, Ind. 588.
for hay and seed, variety tests, Md. 517.
for pigs, Ohio 591.
improvement, N.J. 517.
inheritance of resistance to blast, 267.
Markton, smut resistance in, Mich. 84.
moth pest, 714.
natural crossing in, 25, 231.

Oats—Continued.
of State, destination and origin, Iowa 470.
planting tests, Ohio 30.
prices, cash and futures, Iowa 470.
production, Alaska 520.
rotation experiments, Nebr. 517.
seed for rod rows, quantity determination, 34.
seed-borne diseases, control, Iowa 390.
sprouted, feeding value, Hawaii, 448.
stored, respiration in, relation to moisture, Iowa 378.
time of planting test, La. 123.
uptake of nutritive material by, 661.
varieties and strains, N.J. 123.
varieties and strains, registration, 128.
varieties, grinding, power requirements, Ohio 75.
varieties, purification, Calif. 516.
variety tests, Iowa 378; La. 28, 123, 233; Mo. 378; N.Dak. 667; N.Mex. 29; Nebr. 517; Ohio 30, 517; Tex. 668; Wyo. 30.
yields, Ind. 667.
Obeliscoides cuniculi, life history, 461.
Oberea bimaculata, see Raspberry cane borers.
Ocme rigida, notes, 579.
Oecanthus niveus, see Cricket, snowy tree.
Oesophagostomum—
columbianum—
in sheep and goats, control, 602.
in sheep, association with Preisz-Nocard bacillus, 744.
larvae, food requirements, Ohio 69.
dentatum, notes, 282.
venulosum, notes, 601.
Oestrin—
and lutein combinations, effect on uterus of mice, 232.
urinary excretion, 122.
Office of—
Experiment Stations, new quarters, editorial, 1.
Farm Management, origin and development, 469.
Ohio State University, notes, 351.
Ohio Station—
county experiment farms, report, 94.
personnel and publications, fifty-year index, 494.
report, 94.
Oil—
emulsions and acid lead arsenate, compatibility, 425.
emulsions as insecticides, 561.
injecting into udder before milking, effect, Iowa 447.
meals as protein supplements, Ohio 65.
plant seeds, effect of carbon disulfide and chloropicrin, 706.
seeds, structure and composition, 472.
sprays, systematic study, Mass. 424.
sprays, tank-mixture method of use, Calif. 563.
sprays, use, 283.
Oils—*see also* Fats *and specific oils*.
lemon and orange, analyses and composition, U.S.D.A. 100.
lubricating, carbonization, 466.
lubricating, consumption in tractor engines, relation to volatility, 326.
lubricating, uses and applications, 466.
paraffin-base, improved, 174.
spray, properties, 504.
structure and composition, 472.
summer, for codling moth control, Mo. 424.
summer, v. lead arsenate for codling moth control, 425.
Okra pods, young, infestation by pink bollworm, 578.
Olethreutes schistaceana, notes, 562.
Olive moth, new enemy, 285.
Olive plantlets, effects of uranium radiation, 512.
Olives, studies, Calif. 526.
Omorgus mutabilis, primary larvae, parasitic on European pine shoot moth, 290.
Omphalia flavida, notes, 47, 400.
Oncholaimus pristiurus, notes, 282.
Oncideres cingulatus, *see* Twig girdler.
Onion—
bulbs, wounding, effect on seed production, 676.
disease, new, in epidemic form in Iowa, 548.
diseases, notes, 405; Iowa 399; Mass. 399.
insects, Iowa 424.
maggot flies, use of blower for, Wis. 706.
maggot, notes, 424; Ohio 50.
pink root, resistant varieties, Calif. 525.
thrips as vector of plant virus disease, 151.
thrips, control, 709; Mass. 424.
thrips, relation to tomato spotted wilt, 551.
thrips, studies, 151.
thrips, transmission of pineapple yellow spot virus by, 567.
yellow dwarf, studies, 432, 548.
Onions—
breeding, La. 244; Mass. 385.
colored, disease resistance in, Wis. 690.
culture, Mass. 385.
culture experiments, N.Mex. 35.
fertilizer experiments, N.Mex. 35; Tex. 674.
irrigation, duty of water for, N.Mex. 76.
pellagra-preventive value, 488.
utilization studies, Mass. 473.
Oospora scabies, *see* Potato scab.
Ophiobolus—
graminis infection of wheat, chemical and morphological phenomena, 692.
graminis, notes, 537, 542.
kusanoi n.sp., proposed name, 269.
sp., notes, 268.

Ophiola striatula, notes, Mass. 428.
Orange—
juice, cold storage studies, Fla. 523.
juice, deterioration, relation to iodine-reducing value, 503.
juice, vitamin B (B_1) in, 634.
leaves, (gum formation in, Calif. 279.
oil, analyses and composition, U.S.D.A. 100.
peel, vitamin B (B_1) in, 634.
stock, sour, spraying experiments, 400.
worm, economic survey, 423.
Oranges—
cold storage studies, Fla. 523
culture, U.S.D.A. 35.
fertilizer experiments, Fla. 523; La. 244.
Hawaiian, vitamin C in, Hawaii 473.
on rough lemon and sour stocks, chemical studies, Fla. 523.
peculiar spotting, in central California, 50.
Satsuma, effect of potash, 396.
Satsuma, fertilizer experiments, La. 130.
Satsuma, mutated forms, effect of temperature, 260.
storage experiments, Tex. 396, 674.
studies, Calif. 526.
use for acidification of milk for stomach ulcers, Wis. 769.
variety tests, Tex. 673.
vitamin B complex in, 632.
vitamin C in, 344.
Orchard—
grass seed analysis, problems, 522.
heater smoke, measurement, 611.
surveys, Ohio 35.
Orchards—*see also* Fruits, Apples, Peaches, *etc.*
home, income from, Mo. 251.
management, Mass. 385.
Orchid—
bacterial soft rot, cause, 147.
scale, habits and control, N.J. 561.
weevil, habits and control, N.J. 561.
Oregma lanigera, notes, 562.
Organic—
acids and phosphorus compounds in plants, functional relations, 116.
acids, hydroxy, titration in presence of ferric and cupric salts, 203.
constituents of soil having base-exchange properties, origin, nature, and importance, 215.
matter—
changes in dry farming regions, 219.
decomposition, electrical effects, 115.
in soils, decomposition, Nebr. 505.
in soils, formation, Fla. 505.
requirement of soils, overemphasis, 12.
soluble, in soils, determination of nitrates in, 204.

Organic—Continued.
matter—continued.
utilization as source of carbon dioxide, 223.
Organisms—*see also* Bacteria *and* Microorganisms.
science of variation of abundance, terminology, 285.
Oriental peach moth, *see* Peach moth.
Ornamental plants, shrubs, and trees, *see* Plants, Shrubs, *and* Trees.
Ornithodoros—
moubata, webbing clothes moth as predator, 284.
talaje infesting a house in Canal Zone, 294.
Ornithological nomenclature, treatise, 558.
Orthoptera of Kansas, 429.
Orthoptera of Utah, 429.
Orthotylus translucens, mesquite injured by, 49.
Oryctes rhinoceros, habits and control, 155.
Osborne, Thomas B., medal award, 96.
Oscinis frit, flight habits, 284.
Osmotic exchanges through gelatine membrane, effect of water content, 21.
Osteomalacia—
and late rickets in northern India, 89.
in pigs, Ind. 596.
Osteomyelitis, treatment with blowfly larvae, 437.
Ovariectomy, effect on—
breeding females, 377.
fat distribution and quantity in rats, 773.
Ovaries, transplantation experiments, 27.
Ovens, electric and gas range, tests, Ind. 637.
Ovulation—
in rabbits induced by injection of anterior hypophysis, 120.
mechanism in rabbits, 28.
size of Graafian follicle at, 121.
Ox blood pressure, 71.
Ox warbles, dressing cattle for extermination, 291.
Oxalic acid, titration in presence of ferric and cupric salts, 203.
Oxides, insecticide action, 426.
Oxygen—
consumption of small animals, chamber for measuring, 297.
use in quick determination of ash, 361.
α-Oxyphenazine, formation of semiquinones as intermediary reduction products from, 197.
Oysters—
a means of copper administration, 91.
studies, N.J. 558.
value in nutritional anemia, 91.
Oyster-shell scale, notes, 283.
Ozonium omnivorum, *see Phymatotrichum omnivorum*.
Pachynematus—
laricivorus n.sp., description, 157.
nigricorpus n.sp., description, 157.

Paddy, see Rice.
Paint, durability, effect of priming methods, 79.
Paints, house, special primers for, 80.
Palarus saishiuensis, notes, U.S.D.A. 582.
Palm, coconut, *see* Coconut.
Palm diseases, studies, Calif. 535.
Palm plantations, storm-devastated, restoration, 279.
Panama berry tree, propagation, Hawaii 385.
Pandemis—
  limitata, life history and habits, 571.
  pyrusana, notes, Calif. 559.
Panolis flammea, biology and control, 284.
Papayas—
  as supplementary feeds for poultry, Hawaii 302.
  culture experiments, Tex. 673.
Paper mulch—
  experiments with vegetables, R.I. 233, 244.
  studies, 246; Tex. 674.
  use in forest nursery, Mich. 398.
  use in forest nursery and field plantations, 686.
Papilionaceae, mosaic among, 141.
Paradichlorobenzene, fall v. spring applications for peach borer, 50.
Paragonimiasis in an Ontario domestic fox, 596.
Paragonimus lung fluke in North America, 585.
Paralysis—
  avian, notes, Mass. 457.
  breeding, in ewes, Ind. 596.
  lumbar, in mules, 745.
  of chicks, Ohio 58.
  of chicks, affecting legs and feet, 730.
  of fowls, 171, 603; Fla. 596; N.H. 596; Va. 747.
  of fowls, effect of rations, Iowa 444.
  of fowls, forms, pathogenesis, 458.
  of fowls, inheritance of resistance, 321.
  of pigs, Ind. 596.
  posterior, in a lamb, 168.
  range, in poultry, Iowa 450.
Parametorchis canadensis, notes, 596.
Parasites—
  animal, P.R. 597.
  introduction into British Columbia, 284.
  introductions for gipsy moth and other tree pests, 565.
  of equines, eradication, 318.
Parasitology, insect, discussion, 565.
Paratetranychus—
  ilicis n.sp., control, Mich. 57.
  pilosus, *see* Red mite, European.
  ununguis, injury to spruce, 569.
Paratheresia claripalpis—
  as sugarcane borer parasite, 715.
  collecting in South America, 57.
Paratuberculosis, *see* Johne's disease.
Paresis, parturient, *see* Milk fever.
Paris green—
  colloidal, action on Culex larvae, 574.
Paris green—Continued.
  with charcoal as diluent for Anopheles, 715.
Parrots and parrakeets, virus disease differing from psittacosis, 743.
Parsley, iron in, U.S.D.A. 85.
Parsnip seed, quality on sale in New York, N.Y.State 130.
Parsnips, vitamin B (B_1) in, 634.
Pasteurella—
  avicida, notes, 320.
  avicida persistence in blood and organs of fowls, 171.
  boviseptica, relation to pleuropneumonia, 315.
  hemolytica, proposed name, 745.
Pasteurization, *see* Milk.
Pasture—
  crops, comparison for dairy cows, S.Dak. 158.
  grass, yield and composition, effect of fertilizers, 234.
  plants, growth, relation to pH, 666.
Pastures—*see also* Grasses, Grassland, *and* Meadows.
  bluegrass v. white clover, for sheep, Nev. 445.
  carrying capacity cost and returns, Ind. 612.
  carrying capacity, effect of nitrogen fertilization, N.J. 594.
  composition of vegetation, effect of fertilization, 236.
  economic use of land for, Ind. 758.
  experiments, Fla. 516.
  fertilizer experiments, N.J. 517; Ohio 29; Wis. 669.
  for pigs, La. 727.
  forage mixtures for, tests, Wyo. 31.
  improvement, N.Dak. 667.
  improvement and management, N.Y. Cornell 236; Tex. 668.
  improvement in Great Britain, 236.
  management in Great Britain and Europe, 237.
  of Belgian Congo, improvement, 125.
  permanent, studies, Mass. 665.
  productivity, Mo. 367.
  response to fertilizers, Ind. 667.
  rough and hill, improvement, 236.
  studies, La. 123; Mass. 378.
  white grubs in, relation to environment, 292.
  yields, effect of drought, Ohio 80.
Pavement design, concrete, U.S.D.A. 468.
Pea—
  aphids, control in alfalfa fields, 569.
  cutworms, arsenic spray for, effectiveness, 286.
  diseases, notes, 405.
  root rot, effect on ripening quality, 695.
  seeds, effect of ultra-violet light on, 387.
  wilt disease, organisms causing, 289.
  wilt resistant strains, Wis. 690.
Peach—
  and almond hybrid, description, 135.

Peach—Continued.
- aphid, green, on potato, N.Y.State 710.
- bacterial spot, new spray for, 700.
- bacterial spot, notes, 275, 414, 551; U.S.D.A. 145.
- blight, Coryneum, symptoms and control, Mich. 45.
- borer, control, Ohio 38.
- borer control, fall v. spring applications of paradichlorobenzene, 50.
- borer, lesser, notes, S.Dak. 51.
- brown rot, control, 275.
- die-back disease in Japan, fungi causing, 145.
- diseases, epidemic in Illinois, 410.
- drops, burying, 558.
- mosaic, new virus disease, 701.
- moth, oriental—
  - *and parasites, Ohio 50.*
  - bait traps for, efficiency, 54.
  - control, 425; Ind. 560.
  - control, value of parasites, 442.
  - distributing parasites of, Conn. State 559.
  - effect of artificial illumination, 572.
  - in Georgia peach belt, 705.
  - in Kentucky, 560.
  - in New York State, 427, 572.
  - in Ohio, 424.
  - insecticide and parasite control, N.J. 560.
  - larvae, time of leaving fruit, 713.
  - new sprays for, 572.
  - parasites of, 561, 582; N.Y.State 441, 442.
  - situation, new phases, 425.
  - *studies*, 283.
- moth, parasitism and winter control, 423.
- orchards, Hudson Valley, new insect pest, 705.
- phony disease, description, 700.
- pollen, duration of viability in, Calif. 512.
- rust, control, 701.
- tree sour sap, cause, 700.
- twig borer, control, 705.
- twigs, nitrogen concentration under sandhills conditions, 529.
- yellows, control, 551.

Peaches—
- arsenical injury, 563.
- breeding, Iowa, 385; Tex. 673.
- bud variation in, U.S.D.A. 184.
- bud variation in, correction, U.S.D.A. 680.
- carotenoid content, relation to light, 245.
- culture experiments, Miss. 35.
- delayed foliation character, nature of inheritance, Calif. 612.
- Elberta, growth and yield, effects of time and rate of nitrate fertilization, 529.
- fertilizer experiments, Md. 524.
- genetic composition, Mass. 385.

Peaches—Continued.
- Georgia Belle, fruit development, relation to soil moisture and leaf area, 528.
- grades, Ga. 185.
- growth, N.J. 524.
- heat requirements, 256.
- imported Canadian, wastage types, 411.
- insects affecting in Tennessee, 561.
- internal composition of shoots, relation to tree response, 527.
- pollination and pollen viability, N.J. 524.
- pollination studies, 249.
- production, N.Y.State 681.
- propagation, flower types and fruit buds, N.J. 524.
- *properties and chemical composition, relation to leaf area*, 528.
- pruning, 257; Mich. 392; Miss. 35.
- pruning and fertilization, Ind. 528.
- refrigerated, functional change in, 414.
- rejuvenation experiments, Md. 524.
- responses to sodium nitrate, 529.
- Saucer, species hybrids as ornamentals, 530.
- size and quality, relation to leaf area, 528.
- spray schedule for, N.J. 38.
- spraying, 274, 275.
- spraying, arsenical substitutes for, 561.
- thinning and related problems, 258.
- thinning, early, Ohio 36.
- varieties, Ind. 523.
- variety, new hybrid, Mich. 39.
- variety tests, Ind. 673; Miss. 35; Tex. 673.

Peanut—
- leaf spot, extension in Africa, 696.
- leaf spot, notes, Fla. 536.
- *meal as protein supplements, Calif.* 588.

Peanuts—
- breeding, Fla. 516; Tex. 668.
- chromosome number in, 24.
- fertilizer experiments, Fla. 516; Va. 668.
- for nuts and hay, U.S.D.A. 30.
- varieties, treatment with land plaster, Fla. 516.
- variety tests, Miss. 29; Tex. 668; Va. 668.

Pear—
- anthracnose, causal organism, 563.
- bacterial disease, new, 146.
- bark miner, biology and control, 579.
- black spot or scab in Western Australia, 413.
- blight, epidemic in Illinois, 410.
- blister mite, *control*, Calif. 559.
- diseases, control, Calif. 535.
- diseases under overhead irrigation, 554.
- flower bud weevil, biology, 293.
- fruit rot, notes, 553.

Pear—Continued.
- *leaf blister mite, injury*, Calif. 584.
- leaf blister mite, notes, 705.
- midge, abundance, relation to shelter, 574.
- midge, control, N.Y.State 715.
- midge, notes, 427.
- mite, notes, 705.
- orchards, plant bugs affecting, 709.
- powdery mildew, control, 554.
- psylla, dormant oil sprays for, N.Y.State 710.
- scab, control, 553.
- scab, spraying tests, 414.
- seedlings, characteristics, 37.
- shoots, Bartlett, nitrogen in, 255.
- tingids, new enemy, 285.
- tissue, electrical resistance as index of maturity, Oreg. 680.
- trees, Pineapple, dying, La. 143, 263.
- trees, pruning, effects, 254.

Pears—
- breeding, Iowa, 385.
- coloring and ripening with ethylene gas, 392.
- culture experiments, Ohio 35.
- fall and winter, harvesting and handling, U.S.D.A. 134.
- fertilizer experiments, 387.
- imported Canadian, wastage types, 411.
- pollination, 249; N.Y.State 677.
- spray schedule for, N.J. 38.
- studies, Calif. 526.
- variety tests, Tex. 673.

Peas—
- and vetch sown with Kanota oats for hay, Calif. 516.
- behavior in grinding, 177.
- breeding, Wis. 674.
- California, composition and time for cooking, 770.
- composition, changes during development, Calif. 525.
- cost of production, N.J. 613.
- date, rate, and depth of planting trials, Wis. 674.
- dried, loss of glucose on soaking, 621.
- fertilizer experiments, Ill. 36.
- fruit development, changes accompanying, 248.
- harvesting with combine, 327.
- iron in, U.S.D.A. 85.
- origin, 131.
- *pigeon*—
  - collar and stem canker on, 45.
  - improvement, culture, and utilization, Hawaii 239.
  - variety tests, P.R. 517.
- strains resistant to homopterous insects, 53.
- structure, composition, and quality, effect of nutrient solutions, 131.
- testing tenderness, device for adding load at steady rate, 770.
- transition region, anatomy, 182.
- uptake of nutritive material by, 661.

Peas—Continued.
- varieties, hardshell seeds in, N.Y.State 674.
- variety tests, Mass. 378; N.Dak. 667.

Peat—*see also* Moor soils.
- extracts, decolorization, 380.
- lands, measurements of subsidence, Calif. 504.
- lands, subsidence and durability, 323.
- mulches, tests, Ohio 36.
- organic colloids in, 112.
- soils, acidity and base-exchange in, Wis. 657.
- soils, organic matter, relation to organic carbon in, 656.
- uronic acid complexes in, 16.
- virgin, microbiological activities, effect of fertilizers, 221.

Pecan—
- cigar case bearer, notes, Fla. 559.
- downy spot disease, notes, 147.
- nut case bearer, notes, Tex. 705.

Pecans—
- culture, Fla. 523; La. 130; Miss. 35; U.S.D.A. 35.
- development of embryo and endosperm, 685.
- dichogamy in, Tex. 533.
- fertilizer experiments, Fla. 523.
- growth and reproduction, relation to nitrogen absorption and storage, Fla. 523.
- insects affecting, control, 150.
- morphology and anatomy of fruit, 261.
- pruning, Miss. 35.
- studies, La. 136.
- varieties, anatomical differences, 684.
- varieties, characteristics, 684.
- varieties in North Carolina, performance records, 684.
- variety tests, La. 130; Miss. 35; Tex. 673.
- vitamin A in, 777.

Pectinophora gossypiella, see Bollworm, pink.

Pegomyia—
- *brassicae*, see Cabbage maggot.
- *hyoscyami*, treatise, 291.

Pellagra—
- and alcoholism, results of liver treatment, 780.
- etiology and pathologic anatomy, 349.
- etiology, notes, 686.
- etiology, relation to solar radiation, 488.
- preventive action of foods, 488.
- rôle of iron deficiency, 92.
- toxin, chemical nature, 488.
- treatment, 488.

Pellicularia koleroga, notes, 400.

Penicillium—
- *expansum* on apples, Wash.Col. 699.
- *glaucum*, notes, 746.
- *oxalicum* on corn, 694.
- spp., notes, 47.

Penitentiaries, United States, diets in, 474.

Pennsylvania—
College, notes, 96, 192, 495.
Station, notes, 96, 192, 495.
Pentalonia nigronervosa, notes, 702.
Pentosans, determination, 364.
Pentoses, determination, 364.
Pepper—
diseases in Florida, Fla. 141.
maggot fly, attraction to spray baits, 564.
maggot, notes, N.J. 561.
mosaic, notes, 544.
weevil, control, Calif. 559.
Peppers—
bell, variety tests, Tex. 673.
breeding, La. 244.
cost of production, N.J. 613.
fertilizer experiments, Ill. 36.
market diseases, identification, U.S.D.A. 405.
natural crossing, Calif. 525.
seed improvement studies, Mass. 386.
sweet, fertilizer experiments, La. 130.
variety tests, Conn.State 523.
Peptic ulcer, treatment with hog gastric mucin, 492.
Perennials, treatise, 261.
Peridermium—
acicolum on pine, 704.
strobi, *see* White pine blister rust.
Periodometer, description, 654.
Periplaneta americana, *see* Cockroach, American.
Perisierola sp., notes, 571.
Permeability, monograph, 508.
Permeability of soils, N.Mex. 16.
Permutites, base-exchange reactions, equilibria, 14.
Peronospora—
hyoscyami, notes, 409.
sparsa on greenhouse roses, 280.
spp., notes, 405.
Peroxidase—
activity, 6.
systems, function, 645.
Persimmons—
studies, Calif. 526.
variety tests, Tex. 673.
Perspiration, artificial, effect on breaking strength of weighted and unweighted silks, 781.
Pest control—
inventions in United States, trend, 705.
patents relating to, U.S.D.A. 150.
Pestalozzia fuchsiae, notes, 264.
Pests in Bristol Province, 284.
Petroleum spray oils, properties, 504.
Petunia hybrids, triploid, chromosome behavior in, 513.
Pezizella lythri, asexual fructifications, 702.
Pezomachus fallax, notes, 157.
Phaeocytosporella n.g., notes, 694.
Phaeocytosporella zeae, notes, 694.
Pheasants—
arthritis and periarthritis in, 75.
treatise, 422.
Phenacoccus perguandei in Japan, 286.
Phlegethontius sexta, *see* Tomato worm.
Phloeothrips oleae, relation to bark beetles of olive, 285.
Phlox, chromosome numbers in, 374.
Phoma—
domestica, notes, 264.
intricans on willows, 704.
lingam, synonymy, 409.
Phoracantha semipunctata in *eucalyptus* plantations in South Africa, 293.
Phorbia cepetorum, *see* Onion maggot.
Phormia regina for use in treatment of osteomyelitis, 437.
Phosphate—
fertilization, studies, Calif. 504.
rock, as mineral feed, safe limits, Wis. 723, 731.
rock, availability indicated by phosphorus assimilation of plants, 223.
Phosphates—
availability values, Neubauer method, 106.
available in Saskatchewan soils, determination, 219.
comparison, Ind. 656.
deficiency in Montana soils, Mont. 370.
effect on phosphoric acid in plants, 507.
effect on soil reaction, 658.
in plants, field test, 302.
in soils, availability, Ariz. 370.
solvents for, citric acid v. neutral ammonium citrate, 205.
sources, 17.
Phospholipids, metabolism, 774.
Phosphoric acid—
and plant diseases, 401.
rôle in nutrition of plum trees, 45.
Phosphorus—
and calcium determinations, rabbit as experimental animal, 296.
assimilation by plants as indication of availability of rock phosphate, 223.
assimilation by rye seedlings, 118.
available in soils, determination, Niklas and Truog methods, comparison, 652.
compounds and organic acids in plants, functional relations, 116.
deficiency in soils, diagnosis, 652; Ind. 651.
determination, blue colorimetric *method*, 6.
determination in tissues, effect of trichloracetic acid, 205.
effect on plant growth, S.Dak. 30.
in plants, effect on physiological functions, 116.
metabolism in dairy cattle, 731, 732.
metabolism in infants, 340, 476.
metabolism in rats, effect of irradiated ergosterol in large doses, 89.
relation to fruiting of cotton, Ark. 669.
sources for cotton, comparison, Miss. 29.

Photoperiodism, internal mechanism, Mo. 372.
Photosynthesis—
amount, relation to water content, 116.
in presence of alkaloids, 660.
Phyllodecta vitellinae, control, 284.
Phyllosticta—
solitaria, notes, 410.
spp., notes, 264.
zeae, notes, 694.
Phyllotoma nemorata—
and *Fenusa pumila*, differentiation, 722.
in northern New York and New England, 721.
Phylloxera, petroleum as remedy, 285.
Phymatotrichum omnivorum—
effect on ammonia gas, 141.
laboratory production of sclerotia, soil cultures for, Tex. 545.
life history studies, Tex. 546.
notes, 266; U.S.D.A. 44.
on cotton, leaf temperatures with, 406.
Physalospora in Hawaii, 402.
Physalospora—
malorum, notes, 410.
miyabeana on willows, 704.
sp. causing stem and collar canker on pigeon pea, 45.
zeae, notes, 694.
Physiology, comparative, surface-area constant in, 769.
Physoderma zeae-maydis on corn, control, Fla. 536.
Phytomonas insidiosum, notes, 693.
Phytomonas rubrilineans, notes, 272.
Phytomyza ilicis, notes, 284.
Phytonomus posticus, *see* Alfalfa weevil.
Phytophaga destructor, *see* Hessian fly.
Phytophthora, diplanetic species, on potato tubers, 548.
Phytophthora—
cactorum, notes, 279.
infestans, *see* Potato blight, late, *and* Tomato blight.
nicotianae, notes, 550.
sp. on honeydew melons, 548.
spp., notes, 399, 400.
syringae, notes, 553.
Pickle brine, mycoderma scums on, prevention, Mich. 494.
Pigeon—
carcasses, minerals in, effect of polished rice diet, 489.
fly, biology, 155.
paratyphoid, notes, N.J. 602.
pox in Michigan, 171.
pox vaccine, immunizing agent for fowl pox, 321.
pox vaccine, use, N.J. 602.
pox virus as vaccine for fowl pox, results, Ohio 603.
Pigeons—
inheritance in, 231.
rice-fed, lactic acid in organs, effects of rest and exercise, 340.
vitamin B (B_1) requirement, 633.
Pigmentation in ragi, inheritance, 25.
Pigments, plant, in fowl nutrition, 631.
Pigments, yellow, of plants, source of vitamin A, Fla. 619.
Pigs—*see also* Sows *and* Swine.
anemic and nonanemic, feeding paratyphoid-enteritidis group of organisms to, results, 73.
breeding, Iowa 444.
breeding stock, evaluation, Iowa 444.
compounding rations for, 724.
fattening, Fla. 588; Okla.Panhandle 301.
fattening, comparison of grains for, S. Dak. 58.
feeding, Ill. 727.
feeding and nutrition experiments, La. 294; Ohio 58.
feeding experiments, Ind. 588; Iowa 444; La. 727; Md. 592; Mo. 445; N.Dak. 722; N.J. 591; Nebr. 589; Nev. 300; Ohio 591; S.Dak. 58.
grazing crops v. dry lot feeding, Fla. 588.
handling to prevent shrinkage during shipping, Ohio 58.
home-grown grains for, Wyo. 59.
industry, statistical data, Calif. 616.
management and feed v. breeding or heredity, Oreg. 728.
marketing, Ind. 688.
mineral metabolism, 299.
of Iowa, marketing, seasonal fluctuations, Iowa 470.
reproduction, relation to nutrition, Mo. 591.
shipping by rail, shrinkage in, Ind. 764.
skeletal deformities, Calif. 588.
small, lesions due to *Salmonella suipestifer*, prevention, 73.
suckling, development, 60.
trinity mixture v. other protein supplements, Ohio 58.
trucked to market, shrinkage, Ind. 588.
types marketed and consumer demand, Oreg. 763.
variation in yield, Ohio 80.
worming with oil of chenopodium, S.Dak. 58.
young, mortality rate, Kans. 299.
Pike Bay Experimental Forest, notes, 95.
Pimpla detrita, notes, 157.
Pine—*see also* White pine.
blister rust, *see* White pine blister rust.
forest, Japanese black, function of fallen leaves in, 534.
forest, virgin Norway, light intensity relation to plant growth, 262.
forest-pulled and nursery-grown planting stock, results, 686.
forests, clear felled areas, fauna, 285.
lodgepole, destructive defoliators in Yellowstone National Park, U.S.D.A. 707.
Monterey, in Spain, growth and pulp-producing capacities, 41.

Pine—Continued.
moth, new, from Connecticut, 435.
noctuid, biology and control, 284.
oils for protection of rustic furniture and log cabins from wood borers, 579.
pitch, seeding habit, 533.
pitch, sweetfern blister rust on, U.S.D.A 148.
pseudomedullary rays in, 371.
root growth, N.H. 533.
rust in Lake States region, 704.
sawdust, fuel briquets from, 465.
seed beds, damping-off in, effect of superphosphate, 41.
shoot moth, European, notes, 565; Conn.State 559; N.J. 561.
shoot moth, European, primary larvae of parasites, 290.
short branch in, 557.
tube moth in Yellowstone National Park, U.S.D.A. 707.

Pineapple—
root failure, cause, 558.
yellow spot virus, transmission by *Thrips tabaci*, 567.

Pineapples—
chlorosis in, iron sulfate for, V.I. 525.
fruiting, effect of smoke and ethylene, 532.
influencing time of blooming, P.R. 525.

Pinene in turpentine, evaluation, U.S.D.A. 9.

Pink bollworm, *see* Bollworm, pink.

Pinus radiata in New Zealand, insect enemies, 566.

Piroplasma bigeminum bovis, notes, 743.

Piroplasma bigeminum, notes, 600.

Piroplasmoses—
of bovines in Turkey, 600.
treatment with T. 21, Wyo. 70.

Piroplasmosis—
in Indian cattle, diagnosis, 450.
in livestock, 313.
treatment with ichthargan, 743.
types in Egypt, 743.

Pissodes strobi, *see* White pine weevil.

Pituitary hormone, anterior, control of special secretion of the crop gland in pigeons by, 122.

Plant—
breeding—*see also* Hybridization *and specific plants.*
Russian experiments, 234.
bugs, larger, on citrus and truck crops, Fla. 559.
cells—
current of injury in, 373.
diseased, vacuolar changes in, 538.
killing by freezing, 245.
life of, inclosures of living matter, 659.
living, penetration by weak acids, 372.
reaction to fungus haustoria, 689.

Plant—Continued.
chromosomes, *see* Chromosomes.
containers, types, moisture, air, and soil pH relations, Mass. 385.
cultures, effect of renewal of nutrient solutions on pH, 21.
cuttings, rooting response to age of tissue, 245.
cuttings, stimulation of rooting and effect of defoliation, Ohio 36.
disease resistance, possible factor in, 277.
diseases—*see also* Fungi *and different host plants.*
control, great economic world problem, 680.
diagnosis by serological reactions, 137.
epidemic, studies, 43.
in Malay, 401.
in New Jersey, N.J. 536.
in Prussia, 400.
new, in Massachusetts, Mass. 399.
notes, Conn.State 535.
on university farm Maksimir, 400.
relation to environment, Ohio 689.
relation to phosphorus deficiencies, 401.
relation to reaction of leaf sap, 401.
resistance to, increase with altitude, 538.
seed-borne, 522.
treatise, 538.
virus, cytological studies, 689.
virus, purification of virus fraction, Mo. 409.
virus, relation to insect vectors, 428.
extracts, sugars in, determination, N.H. 653.
growth—
and soil conditions, 108.
concentration of nutrient medium v. pH, 22.
effect of artificial light, 659.
effect of humic acids, 223.
effect of light quality, Mass. 385.
in electric light, 115.
lice attacking potato on Long Island, N.Y.State 710.
lice control in orchards, 424.
lice in Japan, 286.
material, methoxyl group in, determination, 206.
material test for diagnosing phosphorus deficiencies, Ind. 651.
materials, uronic acid complexes in, 16.
parasites, effect of environment on infection, 538.
pathogens, bacterial, treatise, 688.
pests, biological control, 287.
pigmentation, *see* Pigmentation *and* Pigments.
roots, effect of hot water treatment for Japanese beetle, U.S.D.A. 56.

Plant—Continued.
tissues, bound water in, 504.
tissues, expressed liquids, pH and phosphorus in, 15.
tissues, greenness, relation to vitamin A potency, N.J. 587.
water loss, effect of spray materials, Ohio 43.
Plants—*see also* Flora.
action of metabolic products of micro-organisms on, 538.
aluminum in, 479.
animal pests of, treatise, 419.
carbon dioxide assimilation, limiting factors, 659.
changes in during flowering and seed formation, 244.
chlorophyll formation in, after exposure to ultra-violet rays, 20.
copper absorption, Calif. 500.
cross-fertilizing, breeding, 228.
culture under sterile conditions, method, 115.
difficult nursery and greenhouse, propagation, Iowa 385.
dye adsorption by, N.H. 536.
effect of illuminating gas, 386.
effects of ultra-violet and infra-red radiations, 386.
electrical illumination, cost, 609.
feeding power, 659.
feeding via leaves with salt solution, 22.
fiber, *see* Fiber.
food, of muskrats, 420.
for test for insecticidal principles, 284.
fungi of Iowa parasitic on, 263.
greenhouse, effect of fertilizers, Ohio 36.
greenhouse, leafhopper affecting, 431.
herbage, breeding, 518.
honey, Tex. 705.
imported, for testing, U.S.D.A. 24, 115.
in Argentina, fungi affecting, 264.
injury due to asphalt or tar, detection, 373.
internal treatment for insect pests, 284.
iron distribution in, N.J. 508.
manganese in, distribution and value, 118.
nitrate, phosphate, and potassium in, field tests, 362.
nutrition, effect on susceptibility to parasites, 689.
nutrition, relation to vitamins, Iowa 385.
ornamental—
blooming data, N.J. 524.
breeding, Tex. 673.
culture experiments, Ohio 525.
diseases and control, Fla. 536; N.J. 536.
experiments with, N.Mex. 35.
insecticides and fungicides for, 565.
insects affecting, N.J. 561.
Plants—Continued.
Ornamental—continued.
tests, Fla. 523; N.Dak. 673; Nebr. 524; Tex. 673.
phosphoric acid in, effect of phosphates, 507.
phosphorus compounds and organic acids in, relations, 116.
photoperiodic response to reduction of light, Ohio 36.
photosynthesis, *see* Photosynthesis.
physiological functions, effect of phosphorus and day length, 116.
poisonous—*see also* Livestock poisoning *and specific plants*.
for goldfish, 51.
in Kenya, 452.
in Union of South Africa, 70.
to livestock, Tex. 740.
pollination, *see* Pollination.
resistance to wilting and drying, 508.
respiration, *see* Respiration.
response to water deprivation, 116.
susceptibility to sulfur dioxide gas, 386.
transpiration, *see* Transpiration.
uptake of nutritive material by, 601.
Plasma, diffusibility of proteins, 196.
Plasmodiophora—
brassicae, bacteria associated with, 690.
brassicae, notes, 545.
vascularum spores in sugarcane, development, 549.
Plectodiscella—
piri and *P. veneta*, comparison, 412.
piri, synonymy, 553.
veneta, notes, 415.
Plectosphaerella cucumeris, notes, 694.
Pleosphaerulina zeicola, notes, 694.
Plesiocoris rugicollis, control, 284, 507.
Pleuropneumonia in cattle, studies, 312, 315, 451.
Pleurotropis benefica, notes, 157.
Plodia interpunctella, *see* Indian-meal moth.
Plow bottom shapes, method of comparison, 175.
Plowing—
depth of, studies, S.Dak. 80.
electric, in Europe, 609.
or listing, fall and winter v. spring, U.S.D.A. 30.
Plows—
draft, Iowa 462; Ohio 75.
for corn borer control, draft, U.S.D.A. 755.
moldboard, efficient use, U.S.D.A. 755.
Plowshares, treatment by farm smiths, 176.
Plum—
aphid, mealy, control, Calif. 559.
curculio—
late, notes, N.J. 560.
life history and habits, Del. 430.
on apples, 424; Mass. 424; N.Y. State 150.
on peach drops, control, 558.

Plum—Continued.
curculio—continued.
studies, 283.
survey in southern Illinois, 56.
diseases, epidemic in Illinois, 410.
seedling, notes, S.Dak. 36.
seeds, wild, germination and storage, 255.
tree borer, notes, S.Dak. 50.
trees, Japanese, exanthema in, 414.
trees, premature mortality, cause, 45.
Plums—
breeding, Iowa 385; Nebr. 524; Tex. 673.
culture, N.Y.State 681.
effect on reaction of urine, Wis. 769.
faithfulness in, 135.
imported Canadian, wastage types, 411.
pollination, N.Y.State 677.
spray schedule for, N.J. 38.
thinning experiment, 681.
variety tests, Ind. 673; Tex. 673.
Pneumonia—*see also* Pleuropneumonia.
in foals, *Corynebacterium equi* in, 169.
in sheep, bipolar organisms in, 744.
Podosphaera leucotricha, notes, 410.
Pogonomyrmex occidentalis, relation to habitat, 581.
Poisonous plants, *see* Livestock poisoning, Plants, poisonous, *and specific animals and plants*.
Poisons—
effect on mosquito larvae, 55.
nonarsenical, for Natal fruit fly, 426.
Pollen—
antagonism in cotton, 227.
distribution by bees, device to facilitate, 389.
freezing, effect, 245.
sterility, genes in corn for, 514.
sterility in apples, cytological studies, 119.
tubes behavior in self-incompatibility, 514.
Pollenia rudis, see Cluster fly.
Pollination—*see also specific plants*.
by bees, 424, 427.
by bees, comparative value of colonies, 581.
effect on fruit yields, Md. 524.
Polyarthritis in lambs, cause, Calif. 595.
Polychrosis viteana, see Grape berry moth.
Polycythemia—
experimental, production with cobalt, 488.
production by inorganic elements, 347.
Polyhalite, potash in, availability to plants, Tex. 507.
Polyporus—
schweinitzii, notes, U.S.D.A. 280.
sulphureus, oxidases in, 49.
Polyscelis modestus, seasonal history and morphology, 443.
Polythelia in dairy cattle, inheritance, Mo. 448.
Polytrichum commune, toxicity of nitrates to, 35.
Pome family, seedling differences, 37.
Pomosin, use in ice cream, N.J. 594.
Popcorn, breeding, N.H. 524.
Popillia japonica, see Japanese beetle.
Poplar, yellow, establishment and survival following clear cutting, 687.
Pork—
quality and palatability, factors affecting, Nebr. 589.
soft, prevention, S.Dak. 58.
vitamin B (B_1) in, effect of cooking and canning, N.Dak. 778.
Porthetria dispar, see Gipsy moth.
Portulaca oleracea cuttings, origin of adventitious roots, 40.
Potash—
as fertilizer for tobacco, Conn.State 381.
effect on sugar in prunes, 392.
in polyhalite, availability to plants, Tex. 507.
on potatoes, effect of varying amounts and carriers, Fla. 505.
relation to nitrogen in apple trees, Mo. 386.
response of Wisconsin soils, Wis. 657.
Potassium—
assimilation by rye seedlings, 118.
behavior during soil formation, Mo. 216.
bromate, effect on relation of flour protein and loaf volume, 365.
chloride, effect on Nitella, 511.
cyanide, effect on mosquito larvae, 55.
determination, new colorimetric method, 205.
effect on citrus fruits, 396.
feeding of plants via leaves with, 22.
fertilizers, work of Berlin-Lichterfelde Station, 113.
in organic materials, effect on sodium determination, 105.
in plants, field test, 362.
in small quantities of biological fluids, determination, 105.
in soil, forms, and absorption by crops, Calif. 504.
nitrate, toxicity for moss species, 35.
relation to fruiting of cotton, Ark. 669.
relation to nitrogen in nutrition of *fruit trees*, 133.
replaceable and water-soluble, in soils, test, 363.
sources for cotton, comparison, Miss. 29.
Potato—
aphids on Long Island, *N.Y.State 710.*
aphids, spraying and dusting experiments, 710.
beetle, Colorado, notes, 49, 426.
blackleg, sources of infection, 407.
blight, early and late, notes, Fla. 536.
blight, late, notes, 407; Conn.State. 535; Tex. 690.
blight, western yellow, control, N.Mex. 43.
brown rot, notes, Fla. 535.

Potato—Continued.
canker and climate, 548.
diseases, Calif. 535; Fla. 535; N.Dak. 690; N.J. 536; N.Mex. 43.
diseases in Western Australia, 407.
diseases, virus, 697; Ind. 536; Oreg. 696.
flea beetle, studies, N.Y.State 717; Ohio 50, 439; Wash.Col. 578.
leafhopper, biology, 710.
leafhopper injury to hollyhock and African marigold, 568.
leafhopper on apple nursery stock, control, 709.
mosaic, control, N.Mex. 43.
nematode, notes, 270.
net-necrosis and leaf roll, 548.
pin worm, new pest in Pennsylvania, 50.
pink rot due to diplanetic species of Phytophthora, 548.
powdery scurf, notes, 696.
Rhizoctonia root disease, 142.
rots, biochemistry, 696.
scab in Scandinavia, 408.
scab, notes, Fla. 536.
starch and refection, 485.
starch, heat of hydration, 357.
Synonym Committee, report, 31.
tuber, composition, effect of Phytophthora rot, 696.
tuber moth, relation to climate, 714.
wart disease, test for immunity or susceptibility to, 537.
wart organism, new hosts, 536.
Potatoes—
blackening after cooking, 183.
breeding, Iowa 385; Mo. 378; N.Dak. 667.
California, composition and time for cooking, 770.
cost of production, Mich. 84; N.J. 613.
culture, Ohio 525; U.S.D.A. 35.
culture experiments, Fla. 516; La. 233; Nebr. 517; Wyo. 31.
dry land v. irrigated, cooking qualities and vitamin C in, Wyo. 85.
early, fertilizer experiments, 31; Md. 672.
early, interstate committee, work of, 332.
effect of X-ray treatment, N.J. 517.
fertilizer experiments, 123, 124; Fla. 516; Ill. 36; La. 130, 233; Miss. 35; Mo. 378; N.H. 517; Ohio 29, 30.
fertilizer ratios, Va.Truck 671.
flower and tuber color, inheritance, 228.
in rotation, N.H. 606.
irrigation, duty of water for, N.Mex. 76.
irrigation experiments, N.Mex. 29.
irrigation requirements, Can. 463.
irrigation with porous canvas hose, Mich. 84.
Late Cobbler, a new variety, Ohio 229.
Potatoes—Continued.
leaf and shoot cuttings, regenerative capacities, 37.
Lord Derby Gold Medal, tests, 31.
market diseases, U.S.D.A. 270.
metabolism, effect of cyanide, 510.
narcotine in, 649.
photoperiodism and sprouting, Fla. 516.
planting tests, N.J. 517.
prices per bushel 1926–1932, Ohio 613.
regional strains, physiological behavior, 670.
seed—
and soil-borne diseases, control, Iowa 399.
degeneracy in, Nebr. 517.
dry land v. irrigated, Wyo. 31.
dust treatments of cut pieces, N.Y.State 270.
period of maximum vigor, Ohio 29.
selection, Nebr. 517.
source tests, Fla. 536; R.I. 233.
treatment, La. 233.
small, use for seed, Ohio 29.
soil acidity studies, N.Y.Cornell 15.
spraying experiments, 706.
storage experiments, Fla. 516.
supply of State, sources, Ind. 613.
tuber development, effect of time of planting on dry land, Nebr. 520.
uptake of nutritive material by, 661.
varieties, cooking qualities and composition, Fla. 619.
variety tests, 31; Mo. 378; N.J. 517; Tex. 668; Wyo. 30.
vitamin B (B_1) in, 634.
vitamin B complex in, 343.
vitamin G (B_2) in, La. 341.
Poultry—*see also* Chickens, Ducks, Fowls, *etc.*
bacteria of enteric group in, 170.
blindness in, La. 313.
breeding and selection, N.Dak. 722.
breeding experiments, N.J. 593.
breeding, high-line and low-line Leghorns, N.Y.Cornell 301.
brooder, battery, use, Hawaii 444.
broodiness in, Mass. 446.
certification, N.H. 446.
collapsible summer shelter for, N.J. 612.
compounding rations for, 724.
disease elimination law, Mass. 457.
diseases—*see also specific diseases.*
and parasites, Iowa 450; D.Dak. 739.
control, 450.
detection, importance of autopsies, N.H. 596.
First European Conference, report, 604.
in Kenya, 74.
in New Jersey, N.J. 602.
prevention and eradication, 74.
effect of alkalied grain on, S.Dak. 69.
effect of keeping in cages, Ohio 58.

Poultry—Continued.
- experiments, Calif. 588; N.H. 592; N.J. 593.
- farm production and consumption, Kans. 338.
- farmers, prospective, suggestions for, N.J. 64.
- fattening, buttermilk v. dried skim milk, Mo. 301.
- feed requirements, N.H. 613.
- feed supplements, Hawaii 302.
- feeding and nutrition, La. 294; Ohio 58.
- feeding experiments, N.Mex. 62; Nebr. 589.
- growth studies, Mo. 445.
- houses, heating and ventilation, Ind. 605.
- houses, mite control in, La. 283.
- housing, Ind. 589.
- housing conditions in confinement, La. 295; Ohio 469.
- industry of Iowa, survey, Iowa 180.
- inheritance in, 26.
- judging, 64.
- lice, 596.
- nutrition, vitamin A in, 631.
- parasites of, 171.
- products, production and marketing, Utah 762, 763.
- raising, battery system, 447.
- ration, value of yeast in, Wis. 723.
- rations, measuring vitamin D supplements, Wis. 723.
- slipped tendon, cause, Wis. 723.
- sun yards for, Ohio 203.
- tapeworms, kamala as anthelmintic, Ohio 69.
- worm infestation in, treatment and prevention, 461.
- worm parasites in California, control, 450.

Power lines and wind power in German agriculture, 467.

Prairie—
- grass yield and vigor, effect of clipping treatments, 124.
- hay, studies, Nebr. 125.
- region, shelter belts in, establishment, growth, and effect, Minn. 687.
- tall-grass, ecology and importance of dominants, 235.

Prays endocarpa, life history and habits, 153.

Precipitation—*see also* Rainfall.
- in Great Plains area, relation to crop yields, U.S.D.A. 666.

Preisz-Nocard bacillus—
- association with *Oesophagostomum columbianum* in sheep, 744.
- notes, 600.

Price level, general, future of, 469.

Pricklypear, *see* Cactus.

Pristiphora pallipes, biology, 441.

Pristomerus ocellatus, notes, 442.

Privet anthracnose, notes, 556.

Prodesmometopa latipes on hides, 436.

Progestin and luteinizing hormone, effect on urinary excretion of oestrin, 122.

Prolan—
- ineffectiveness in hypophysectomized animals, 233.
- relation to anterior hypophyseal hormones, 233.

Promecotheca cumingi—
- fungus disease of, 435.
- unusual outbreak in Philippines, 435.

Prophanurus alecto, rearing and distribution, modifications, 443.

Propionic acids, disubstituted, configurational relation with phenyl group, 108.

Proso, production, Colo. 128.

Prospaltella, rôle in protecting fruit against coccids, 285.

Prosthogonimus spp., ducks and chickens as hosts of, 585.

Protein—
- deficient diet, effect on weight of rats, 477.
- foods, iron in, utilization, 185.
- levels in diet, evaluation, 770.
- racemic, optical behavior, 195.
- requirements of chicks, 62; N.H. 592.
- secondary, derived from ipomoein by enzymic action, 3.
- structure, recent contributions, 769.
- supplements for pigs, La. 727.
- tests for wheat, U.S.D.A. 84.

Proteins—
- analysis, Van Slyke method, Ind. 500.
- basic amino acids in, determination, 9.
- colloidal and constitutional changes, relation, 99.
- combination of acid and alkali with, 4.
- egg-yolk, studies, 645.
- feeding experiments, N.J. 591.
- for gilts, Iowa 444.
- for turkeys, amount, Mich. 64.
- in alfalfa, nutritive value, cystine as limiting factor, 723.
- in corn, effect of nitrogen fertilization, N.J. 594.
- in dried milk, difference in digestibility, 737.
- in fish meals, 589.
- in flour, extractions, comparison of solutions for, 357.
- in New Mexico wheat, N.Mex. 29.
- in red clover and alfalfa, comparison, 32.
- of plasma, diffusibility, 196.

Protoparce sexta, studies, Mich. 433.

Protozoology textbook, 282.

Provendeine for market pigs, value, 728.

Prunes—
- dried, quality, relation to specific gravity, Calif. 255.
- effect on reaction of urine, Wis. 769.
- new type of pressure tester for, 392.
- studies, Calif. 526.
- sugar in, effect of potassium, 392.
- vitamins in, 776.

Prunus tomentosa, self-unfruitfulness in, 682.

Psallus seriatus, *see* Cotton flea hopper.
Pseudobalsamia microspora n.sp., description, 695.
Pseudococcus—
  citri, *see* Mealybug, citrus.
  comstocki, notes, 565.
  gahani, control, Calif. 432.
  virgatus, new parasite of, 57.
Pseudolynchia maura, biology, 155.
Pseudomonas—
  aeruginosa, cause of mastitis outbreak, 167.
  citri, *see* Citrus canker.
  endiviae n.sp., notes, 694.
  pisi, notes, 405.
  pruni, notes, 410.
  radicicola, *see* Nodule bacteria.
  tumefaciens—
    biological studies and related nonpathogenic organisms, 265.
    culture experiments, 374.
    lytic principle, potency and specificity, 539.
    notes, 415, 538.
  utiformica n.sp., description, 146.
Pseudoperonospora humuli, notes, 695.
Pseudotuberculosis in guinea pigs, outbreak, 598.
Psila rosae, *see* Carrot rust fly.
Psyllia pyricola, *see* Pear psylla.
Psyllids of California, 423.
Pterandrus rosa, notes, 426.
Pteronidea leucotrochus, biology, 441.
Pterygophorus analis, cattle poisoning from larvae, 441.
Ptochostola microphaella, notes, 714.
Puccinia—
  anomala, studies, U.S.D.A. 266.
  cordiae, notes, 48.
  glumarum, notes, 538, 692.
  glumarum tritici, breeding for immunity to, 693.
  graminis, biological forms in northwest Russia, 691.
  iridis, studies, 556.
  triticina, Heterothallism in, 543.
  triticina, physiologic specialization in, U.S.D.A. 692.
Puerto Rico, scientific survey, 573.
Puerto Rico Station, notes, 495.
Puerto Rico Station, report, 638.
Pullets—*see also* Chickens *and* Poultry.
  cost of production, N.H. 613.
  free range rearing, N.J. 68.
  protein requirements, Ind. 588.
  raising costs, survey, Mich. 64.
Pullorum disease—*see also Salmonella pullorum*.
  agglutination tests, comparison, 603.
  chronic, in adult hen, 74.
  control and eradication, 450.
  in adult fowls, 169, 318.
  in chicks, intestinal flora, 318.
  in Finland, studies, 604.
  in poults, 459.
  mortality per cent, 604.
Pullorum disease—Continued.
  rapid agglutination test, modification, 749.
  report of European Conference on, 604.
  research, N.H. 598.
  studies, Mass. 457.
  test methods, diagnostic efficiency, 459.
Pulvex as Natal fruit fly poison, 427.
Pumping—
  machines and their motors, 79.
  plants, economic design, 322.
  tests, Mass. 365.
Pumpkin bugs, notes, 559.
Pumpkins, canning quality, Ind. 528.
Pumps, low-lift, Mass. 462.
Puncture vine in California, Calif. 523.
Purdue University, notes, 95.
Purine compounds produced by rotting in plant organisms, 661.
Pyocyanine, formation of semiquinones as intermediary reduction products from, 197.
Pyrausta nubilalis, *see* Corn borer, European.
Pyraustinae, Japanese, notes, 286.
Pyrenophora teres, notes, 538.
Pyrethrin sprays for greenhouse pests, 558.
Pyrethrum—
  emulsion sprays and dust, tests, 284.
  extracts, insecticidal value, Va.Truck 150.
Pyrilla spp., notes, 286.
Pyrocalciferol, properties, 201.
Pyroligneous acid as soil disinfectant, 540; Mass. 399.
Pythiaceae structure and phenol coefficient study, Ohio 43.
Pythiacystis citrophthora, notes, 47.
Pythium mamillatum n.sp., description, 697.
Pythium root rot in Hawaii, 272.
Pythium sp., notes, 265.
Quack grass, control, N.Dak. 667; Ohio 30.
Quail—
  in Wisconsin, Wis. 704.
  Oklahoma, winter food, 281.
  tularemia in, 455.
Quince stocks, field propagation, granulated peat moss in, 249.
Quinhydrone-collodion electrode, description, 202.
Rabbit—
  meat, composition, 620.
  stomach worm, life history, 461.
Rabbits—
  as experimental animals for calcium and phosphorus determinations, 296.
  breeding, handbook, 420.
  feeding experiments, Mich. 64.
  frozen, yellowing of abdominal fat, 587.
  hair eating in, Fla. 320.
  injury to forest trees, N.H. 583.
  nutritional requirements, Mo. 445, 480.
  ovulation mechanism, 28.
Rabies—
  immunization, 451.
  intraplantar inoculation of virus, 451.

Rabies—Continued.
vaccine, notes, 450.
Radiation—see also Solar radiation.
sources and characteristics, 90.
Radio waves, effect on insects and plants, N.J. 560.
Radioactive substances, effect on vitamins, Mo. 480.
Radish bacterial spot, 548.
Radium, effect on seed germination, 20.
Rafters, laminated bent, tests, 324.
Ragi, inheritance of characters in, 25.
Ragweed pollen, allergically active substance in, 199.
Ragwort blue stem borer injury, 154.
Raillietina cesticillus, notes, 746.
Rain water, composition at Geneva, N.Y., N.Y.State 220.
Rainfall—*see also* Precipitation.
at Los Angeles, 1850 to 1877, U.S.D.A. 10.
measurement in agricultural climatology, 210.
of southern Rhodesia, 108.
Rancidity studies, 359.
Range—
ecology, symposium on, 124.
improvement, N.Dak. 667.
plants, poisonous, *see* Plants, poisonous, *and specific plants*.
plants, tests, N.Mex. 29.
Rape pasture, full and limited feeding for pigs, Ohio 592.
Rasmussen, F., necrology notes, 192.
Raspberries—
black, breeding, Iowa 385.
black, cost of production, Ohio 36.
black, growth and fruit production, effect of fertilizers, 530.
black, New Logan variety, Mich. 39.
black, propagation, 258.
breeding, 258; Conn.State 523.
fall flowering habit, 530.
fertilizer experiments, 388.
growth studies, 530.
in Michigan, new spinning mite on, 443.
length of fruit developmental period, N.J. 524.
native, Hawaii 385.
new and old canes, transpiration in, 530.
pollination technic, 682.
production, cultural factors in, 395.
pruning methods, effects, 258.
seed and berry size, 394.
size of berries and yield, effect of pruning height, Minn. 39.
varieties, promising, 258.
varieties, self and cross fertility in, 682.
variety tests, 135; N.Dak. 673.
winter hardiness trials, Wis. 674.
Raspberry—
beetle, control, 284.
cane borers, notes, Mich. 438.
Raspberry—Continued.
canes, hardiness, effect of oil sprays, Mo. 386.
crown borer, control, N.J. 524.
crown gall, control, Ohio 43.
diseases, 415.
diseases, virus, in Washington, 554.
mites, control, Mich. 57.
mosaic, symptoms, 554.
virus disease, control, Ohio 43.
Rat baits, canned, Mass. 420.
Rat flea—
experimental transmission of typhus fever by, 577.
oriental, in Puerto Rico, 438.
oriental, multiplication of typhus fever virus, 577.
oriental, transmission of typhus fever by, 438.
oriental, typhus virus in and duration of infectivity, 438.
survey of San Juan, Puerto Rico, 438.
survey of St. Thomas, Virgin Islands, 438.
Rat mites, tropical, vectors of endemic typhus, 282, 722.
Rats—*see also* Rodents.
and reindeer in the Antarctic, 148.
British, classification and description, 49.
control in Punjab, 286.
growth studies, 772; N.J. 587.
in Philippines, worm parasites transmissible to man, 282.
International Conference on, 420.
litter size, effects of nutrition and heredity, 587.
on low-protein diet, changes in weight, 477.
vitamin B (B_1) requirement, 634.
vitamin E-deficient, intrauterine changes in, 485.
Ratti seeds, poisonous to horses, 745.
Rayon, history and process of manufacture, Ohio 637.
Red *mite, European, notes*, 424.
Red scale—
California, notes, Tex. 706.
control, Calif. 559.
control, efficiency of sprays and HCN gas, 423.
Florida, in Egypt, 289.
Red *spider*—
and other vine troubles, 705.
chemically treated bands for, 49.
control, 425, 558.
fruit tree, on plum, control, 157.
on *Asparagus plumosus*, Fla. 559.
on greenhouse cucumbers, control, Ohio 43.
Pacific, control, Calif. 559.
tests of insecticides for, 722.
Red weevil of coconuts, *notes*, 426.
Reducase—
rôle in apple trees, N.J. 524.

Reducase—Continued.
seasonal distribution in apple tree organs, 39.
Redwater—*see* Piroplasmosis, bovine.
Redwater, Rhodesian, *see* African cost fever.
Redwood—
region, timber growing and logging practice, U.S.D.A. 534.
termite resistance, Calif. 533.
Reed canary grass—
breeding, Iowa 378.
culture experiments, Iowa 378; Wis. 669.
tests, 128.
Refrigeration—
farm, Iowa 462.
in handling, processing, and storing of milk, U.S.D.A. 178.
mechanical, for farm egg storage, 331.
mechanical, value on dairy farms, Ind. 593.
of foods and equipment, 469.
Reindeer—
and rats in the Antarctic, 148.
industry of Yurak-Samoyeds, 704.
Reproduction—
and thymus, relation, 122.
in rats, relation to acid-base balance of ration, 627.
in rats, rôle of copper in, 87.
Reptiles—
as host for chiggers and other ectoparasites, 49.
immunological studies, 452.
Respiration—
apparatus for cows, Calif. 593.
at high altitudes, 769.
in insects, 428.
in larvae of parasitic Hymenoptera, 443.
in lettuce, 675.
in plants, effect of phosphorus in, 116.
in plants, rôle of acetaldehyde in, 509.
physiology of, applications, 769.
soil, studies, 657.
Respiratory—
diseases, effect of dietary measures, 489.
tract and middle ear, infection in avitaminosis of rats, 491.
Rhabdias sp., notes, 282.
Rhabditis strongyloides in dogs, 746.
Rhabdocline sp. on Douglas fir in Germany, 557.
Rhagoletis—
boycei n.sp., description, 154.
completa, control, 423.
pomonella, *see* Apple maggot *and* Blueberry maggot.
suavis completa n.subsp., description, 154.
Rhipicephalus—
appendiculatus—
life cycle of *Theileria parva* in, 314.
notes, 168.
Rhipicephalus—Continued.
sanguineus, rôle in transmission of exanthematous fever, 444.
Rhizoctonia—
crocorum, notes, 405; Tex. 556.
solani, notes, 142, 407; N.Y.Cornell 44.
solani on cotton in Trinidad, 546.
solani on strawberries, Oreg. 276.
sp., notes, 407.
Rhizopus nigricans, notes, 746.
Rhode Island College, notes, 784.
Rhode Island Station, notes, 784.
Rhode Island Station, report, 850.
Rhododendron, nutritional requirements, N.J. 508.
Rhopalosiphum—
avenae, biological studies, 286.
persicae, biological control, 694.
prunifoliae, *see* Apple grain aphid.
Rhopobota vacciniana, *see* Fireworm, black-headed.
Rhubarb, composition, relation to age and seasonal conditions, 676.
Rhyacionia buoliana, parasites of, 290.
Rhynchophorus ferrugineus, notes, 426.
Rhynchosporium secalis, notes, 538, 691.
Rhyncocephalus sackeni, oviposition habits, 284.
Rice—
and by-products for feeding livestock, U.S.D.A. 59.
borer, Asiatic, control by parasite, 579.
borer, studies, 286, 435.
bran as preventive of leg weakness, 729.
bran bread, vitamin B (B_1) in, Hawaii 473.
breeding, Tex. 668.
brewer's, feeding value, La. 301.
by-products for laying hens, La. 295.
culture experiments, Tex. 668.
culture, industry, uses, and trade, 129.
diseases, La. 288.
driers in California, operation, 328.
dry speck, control, 44.
factors affecting price, U.S.D.A. 332.
farms, operation costs, La. 332.
fertilizer experiments, Tex. 668.
ground rough, feeding value, Mo. 445.
growth, effect of different iron salts, 23.
in Ceylon, natural crossing, 229.
in United Provinces, classification and characters, 239.
inheritance in, 375.
irrigation, water losses in, Calif. 605.
mold on seeds and seedlings, 267.
new pest in Dutch East Indies, 435.
oil, Philippine, composition, 359.
pests, 288.
plants, grain-shedding character, importance, 129.
plants, symbiotic nitrogen-fixing organisms in roots, 572.

Rice—Continued.
polished, diet, effect on minerals in pigeon carcasses, 489.
starch, heat of hydration, 357.
stem borer, notes, 286.
straw, treatment for borer control, 286.
studies, La. 239.
v. corn for fattening hogs, Mo. 445.
variety tests, Calif. 516; Tex. 668.
water weevil in Arkansas, 579.
weeds in Far East, 384.
Rickets—
in rats, effect of acidophilus milk, La. 345.
infantile, cure with tungsten-filament radiation, 90.
preventive tests with irradiated milk, 489.
preventives in chicks, Iowa 444.
quantity of ultra-violet radiation relation to area of skin exposed, 636.
simple and renal, differences, 489.
treatise, 598.
Rickettsia-like organism in conjunctiva of sheep, 70.
Rinderpest—
control, 72.
dissemination, rôle of leeches in, 315.
forms, differentiation, 451.
in Indo-China, 315.
inoculated, complement fixation reaction in, 451.
studies, 451.
vaccine, studies, 450.
Roads—*see also* Pavement.
concrete, *see* Concrete.
expenditures and taxes for, Wis. 757.
Rock phosphate, *see* Phosphate.
Rockeries, types and plant materials, U.S.D.A. 685.
Rocky Mountain spotted fever tick, transmission of anaplasmosis by, U.S.D.A. 597.
Rodents—*see also* Mice *and* Rats.
burrowing on desert soils in Arizona, effect, 280.
injury to orchards, control, Ohio 38.
under field and village conditions, Fla. 559.
Roentgen rays, *see* X-rays.
Roofing—
prepared, Iowa 462.
sheets, galvanized, production and use, 324.
Roofs and bridges, graphic statics, textbook, 754.
Root knot nematode—
activity, effect of environment, 273.
control, 273.
effect of sunlight and drying, 557.
on pineapple and other crops, 558.
studies, 402.
Root knot, studies, Fla. 559.
Root nodules, *see* Nodule bacteria.
Root overgrowths caused by hairy root and crown gall, use of tape for, Wis. 690.
Roots—
anatomical structure, effect of leafage removal, 661.
development, relation to bacteria, 698.
formation, substance causing, 661.
Rope, wire, effects of bending, 78.
Rose diseases, control, 418.
Rosellinia sp., notes, 399, 400.
Roses—
breeding, Iowa 385.
culture, Miss. 35; N.J. 685.
culture and varieties, Mich. 533.
cytology of triploid, aneuploid, and partially sterile individuals, 514.
greenhouse, *Peronospora sparsa* on, 280.
growth under glass, effect of nutrients, Mass. 385.
new Chaetomella on, 702.
pruning, Miss. 35.
rootstocks, comparison, 397.
sand culture studies, N.J. 524.
treatise, 397.
variety tests, Miss. 35.
Rosinduline, formation of semiquinones as intermediary reduction products from, 197.
Rotation of crops, 123, 124; Fla. 516; La. 123; Miss. 29; N.Dak. 667; Ohio 30; S.Dak. 30; Wyo. 31.
for eastern Canada, 234.
on dry land and under irrigation, Nebr. 517.
with and without wheat, Ohio 29.
Rotenone—
and related compounds as stomach insecticides, 50.
toxicity to red spider, 722.
Roughages, processing for winter stock calves, Mo. 445.
Rubber—
anatomy and physiology, 398.
black stripe, notes, 400.
patch canker, notes, 400.
Rubus rosette, studies, La. 143, 263.
Ruffin, E., gentleman farmer, treatise, 386.
Ruminants, passage of fluids through stomach, 165.
Run-off—
history of a watershed, computing, 606.
investigations in central Illinois, 76.
water, amount of sediment carried by, 220.
Rural—
credit, *see* Agricultural credit.
families, food consumption and selection, Ohio 337.
labor, *see* Agricultural labor.
life, training women for, 767.
Russia under old régime, 471.
sociology, papers on, 182.
standards of living, *see* Standards.
Vermont towns, selective migration from, 336.

Rust—*see also specific hosts.*
black stem, of grains, life history, U.S.D.A. 43.
of Pacific Northwest, key, 266.
of Peru, 539.
Rutabagas, *see* Swedes.
Rutgers University, notes, 640.
Rye—
and wheat hybrid, description, 513.
behavior in grinding, 177.
feeding value, Tex. 723; Wis. 723.
fertilizer experiments, Fla. 516.
improvement, N.J. 517.
leaf blotch, 538.
planting tests, N.J. 517.
seeding, single kernel and broadcasting, 176.
seedlings, assimilation of phosphorus and potassium, 118.
uptake of nutritive material by, 661.
v. barley with corn for hogs, Wyo. 59.
varieties and strains, N.J. 123.
whitehead in Germany, 268.
winter, winter resistance, Iowa 378.
yields, Ind. 667.
Safflower—
as substitute for flax, Wyo. 31.
oil in seed, N.Dak. 667.
Sage hens, tularemia in, 455.
Sainfoin midge in Wiltshire, 284.
Saliva, calcium in, 185.
Salmon oil, vitamins A and D in, 481.
Salmonella—
aertrycke in mice, inheritance of resistance to, 120.
enteritidis, notes, 749.
pullorum—*see also* Pullorum disease.
and related species, dissociation, Mich. 170.
antigen, keeping quality, 460.
growth on culture media, 596.
intracellular toxin in, 459.
studies, 318.
variants, 170, 748.
spp., feeding to anemic and nonanemic pigs, 73.
suipestifer, sterile, phenolized, saline suspension for infected pigs, 73.
Salmonella—
group in sera of normal animals, agglutinins for, 599.
infections in ducklings, 749.
Salsify—
iron in, U.S.D.A. 86.
seed, quality on sale in New York, N.Y.State 130.
Salt—
for growing chicks, Ind. 588.
mixture, modified Osborne-Mendel, 183.
mixture, Osborne-Mendel, with only inorganic constituents, 774.
San Jose scale—
control, 283, 708.
importance, 705.
infestation in Maryland, 565.
return to Michigan, Mich. 53.
tests of spray materials, 561.
Sand, washed, as substitute for soil in greenhouse crops, Ohio 36.
Sandal—
seedling damping-off, notes, 265.
spike disease, papers on, 48.
spiked leaves, intracellular bodies in, 264.
Sandy soils, effect of manure, Wis. 657.
Sanninoidea exitiosa, see Peach borer.
Saponins, poisonous action, 452.
Sarcostemma australe, poisonous to livestock, 597.
Sardine oil as source of vitamin D, Calif. 588.
Sawdust briquets from waste wood, 465.
Sawflies infesting Ribes, biology, 441.
Sawfly—
cattle-poisoning, notes, 441.
larch, control, 157.
new species on pine, 441.
wheat stem, increase in western Canada, 283.
wheat stem, parasites of, 156.
white birch leaf mining, in northeastern States, 721.
Scale insects—
new conifer-infesting, from Japan, 711.
on fruit trees, control, 561.
resistance and population density, 570.
Schizoneura lanigera, see Apple aphid, woolly.
Schoenobius bipunctifer, notes, 286.
Schools—
agricultural, *see* Agricultural schools.
elementary, feeding in, Mass. 477.
Scirpophaga intacta, notes, 562.
Sclerotinia cinerea, notes, 410.
Sclerotinia tuberosa, notes, 690.
Sclerotium—
cepivorum, notes, 405.
coffeicolum, notes, 400.
oryzae, notes, La. 268.
rolfsii, notes, Tex. 546.
Scoliidae, natural enemies, U.S.D.A. 582.
Scolytid beetles, spread of Dutch elm disease by, 284.
Scolytus quadrispinosus, notes, 566.
Scurfy scales, control, 708.
Scurvy and antiscorbutic vitamin, review of literature, 491.
Scutigerella immaculata—
notes, Calif. 559.
on tomatoes, 284.
Seed—
bed, preparation, studies, Tex. 668.
law of Idaho, text, Idaho 384.
testing, papers on, 522.
tests, Iowa 378; Me. 673.
treatment, dry, new preparations for, 266.
Seeds—
analysis, 242.
bibliography, 522.
embryos removed from, germinative capacity, 669.
enzymes in, distribution and isolation, Iowa 378.

Seeds—Continued.
germination, N.J. 524.
germination, action of alkaloids on, 660.
germination biology, 509.
germination, effect of radium, 20.
germination, importance of light in, 509.
germination, physiology, 522.
hard, papers on, 522.
imported, for testing, U.S.D.A. 24, 115.
in fleshy fruits, germination, 21.
inspection, Mass. 522; N.J. 35.
of northern Caucasus, weed seeds in, 384.
oil, *see* Oil seeds.
size, relation to germinability and pH in, 372.
stimulation through increase or decrease of pressure, 660.
toxic and tolerable dosage of Uspulun, 539.
weed, *see* Weed seeds.
Selago corymbosa, control, 243.
Selenium—
as catalyst in Kjeldahl digestion with natural gas heat, 204.
oxychloride as catalyst in nitrogen determination, 203.
Septic tanks, farm, studies, Calif. 605.
Septicemia, hemorrhagic—
in cattle, 596.
organisms, variability, 451.
Septomyxa affinis on tobacco, 550.
Septoria—
gaillardiae, notes, 264.
spp., notes, 694.
tritici, notes, 537.
Serica brunnea, control in coniferous nursery stock, 293.
Sericulture, *see* Silkworms.
Serum, *see* Blood.
Sesame meal as protein supplements, Calif. 588.
Sesamia inferens, notes, 562.
Sesia pictipes, *see* Peach borer, lesser.
Setaleyrodes new genus, erection, 432.
Sewage—
disposal and use for irrigation, N.J. 605.
disposal and water supplies, report, N.J. 751.
sludge, composition and fertilizing value, Tex. 113.
Sex differences from biochemical standpoint, 26.
Sexual—
dynamics, problems, 120.
maturity, precocious, and pituitary-gonadal relation, 121.
Sheep—*see also* Ewes *and* Lambs.
Blackhead Persian, history and characteristics, 60.
blowflies of South Africa, 70.
breeding, Mo. 576; N.H. 516.

Sheep—Continued.
British, coat and fiber development, 727.
compounding rations for, 724.
conjunctiva, organisms in, 70.
Corriedale, adaptation to southwest Texas conditions, Tex. 723.
disease, Nairobi, 168, 452.
diseases, infectious, 450.
effect of feeding timber milk vetch, Wyo. 70.
feeding and nutrition, La. 294; Ohio 58.
fleece weight, relation to skinfolds, Tex. 723.
Hampshire, studies, Wyo. 726.
inheritance studies, Tex. 665.
Merino, feeding for wool production, 726.
mutton qualities in, 298.
place and management in modern farming, 158.
pregnancy disease, N.Dak. 739.
production, economics of, N.Mex. 84, 761.
Rambouillet, B and C type, fleeces, comparison, 727.
scabies, eradication from San Clemente Island, 450.
studies, Calif. 588.
worm parasites, treatment, 601.
Shellfish opihi, composition and value for hemoglobin regeneration, Hawaii 473.
Shipping fever, *see* Pleuropneumonia.
Shrimp bran, feeding value, La. 295.
Shrimp, vitamin D in, La. 341.
Shrubs—
in northwest Texas, Tex. 262.
of South Dakota, S.Dak. 533.
ornamental, variety tests, Tex. 673.
phenological notes, N.J. 524.
tests, Tex. 673.
tolerance to insecticides, 566.
Silage—
cactus, feeding value, Tex. 723.
corn, fly breeding in, 291.
corn, production on farms, N.H. 618.
corn, productive value, Tex. 723.
corn, yield and cost per acre, Md. 613.
corn-soybean, feeding value, La. 295.
cutter, Iowa 462.
density, relation to depth, Mo. 462.
soybean, for dairy cows, Fla. 593.
Silica gels, sorption phenomena in, 110.
Silk—
air permeability, effect of weighting, 781.
artificial, *see* Rayon.
fibroin, basic amino acids in, determination, 9.
washable, effect of laundering and exposure to light, Ohio 93.
weighted and unweighted, breaking strength, effect of storage in dark, 492.

Silk—Continued.
weighted and unweighted, effect of artificial perspiration, 781.
weighted and unweighted, properties, effects of light and air, 492.
Silkworm—
eggs, preservation, 286.
eggs, spring, qualities, 286.
flacherie disease, 152.
Silkworms—
disease in, effect on cocoons, 711.
eri or castor oil, introduction from India into Egypt, 433.
studies, 286, 433.
susceptibility to lead arsenate, 563.
Silo walls, treatment, Iowa 402.
Silos, trench, construction, 611.
Simulium spp. in Michigan, biology, 715.
Siphonaptera of Utah, 425.
Siphosturmia confusa n.sp., description, Tex. 576.
Siphosturmiopsis melampyga n.sp., description, Tex. 576.
Sires—*see also* Bulls.
ages for cattle breeding, Iowa 724.
dairy, age survey, Mich. 448.
dairy, evaluating and proving, Mo. 448.
proving, number of daughters necessary, 304.
Sirex wood wasp, parasite of, biology, and development, 721.
Sisal diseases, notes, 401.
Sitona lineata, monograph, 293.
Sitotroga cerealella, *see* Angoumois grain moth.
Sitrodrepa panicea, *see* Drug-store weevil.
Skim milk—
as feed for dairy cows, 803.
dried, for fattening poultry, Mo. 301.
dry, relation to baking strength of flour, 839.
foam formation, Calif. 593.
powder v. blood flour for calves, Ohio 65.
with and without foam for calves, S.Dak. 65.
Smynthurus viridis, injurious to alfalfa, 429.
Snakes of the world, treatise, 282.
Snapdragons, breeding, Mass. 385.
Snow sampler and scales for measuring water in snow, Utah 654.
Snowberry anthracnose, notes, 556.
Social conflict, papers on, 182.
Sociology, rural—
investigations, Mo. 472.
papers on, 182.
systematic source book, 767.
treatise, 766, 767.
Sodium—
behavior during soil formation, Mo. 216.
chlorate as weed control, 248.
chloride, effect on Nitella, 511.
cyanide, reactions of sulfuric acid on, 705.
Sodium—Continued.
determination in biological material, uranyl zinc acetate method, 7.
fluosilicate as fruit fly poison, 426.
hypobromite for oxidation of organic matter in soil analysis, 7.
hypochlorite, germicidal value, effect of alkalies, Mich. 5.
in organic substances of high potassium content, determination, 105.
nitrate, excessive, effect on young apple trees, N.H. 679.
nitrate, rate and time of application, experiments, S.C. 222.
nitrate, responses of peach to, 529.
nitrate toxicity for moss species, 35.
nitrate v. ammonium sulfate for apples, W.Va. 678.
Sogata furcifera, new parasite of, 710.
Soil—
acidity—*see also* Lime, Liming, *and* Soils, acid.
effects of autumn leaves, N.H. 505.
permanent, effect of concentrated nitrogenous fertilizers, 658.
studies with vegetables, N.Y. Cornell 15.
analysis, bibliography, 12.
analysis, hydrometer for, new type, 212.
analysis, oxidation of organic matter in, 7.
chemistry and soil survey, Tex. 657.
color, measuring, improved method, 212.
composition, effect of green manures, Fla. 505.
conditions and plant growth, 108.
conservation, major problem of agricultural readjustment, U.S.D.A. 614.
disinfectants, Mass. 399.
erosion—
and run-off, effect of forests, 607.
control in Illinois, 607.
prevention in orchards, Mich. 463.
studies, Ind. 605; Mo. 367; Tex. 750.
extracts, decolorization, 360.
fertility—
effect of crop rotation v. continuous cotton, Miss. 29.
plats, Jordan, fiftieth anniversary, Pa. 109.
studies, Ind. 656; Iowa 366; Mo. 367; N.C. 656; N.Dak. 656; N.H. 505; N.J. 505; Nev. 367; Ohio 30; S.Dak. 30; Tex. 668.
studies in sugarcane district, La. 233.
improvement program, 234.
management for Cayuga County, N.Y. Cornell 234.
management for eastern Canada, 234.
maps, basis for mapping original forest cover, Mich. 494.
microbiology, treatise, 109.

Soil—Continued.
moisture, effect of cultivation methods, Ark. 368.
moisture studies, 249, 607.
profile and base-exchange studies, N.J. 505.
profile and root development of fruit trees, relation, Mich. 37.
profiles, evidence of podzolization, 213.
reaction, effect on beans, 140.
reaction, studies, 106.
science, bibliography, 12.
science, handbook, 109.
structure, studies, 213.
survey in—
Alabama, Franklin Co., U.S.D.A. 505.
California, Placerville area, U.S.D.A. 506.
Georgia, Elbert Co., U.S.D.A. 13.
Iowa, Pocahontas Co., U.S.D.A. 214.
Kansas, Johnson Co., U.S.D.A. 214.
Louisiana, Beauregard Parish, U.S.D.A. 655.
Maryland, Anne Arundel Co., U.S.D.A. 214.
Nebraska, Cedar Co., U.S.D.A. 218.
Nebraska, Dixon Co., U.S.D.A. 110.
Nebraska, Stanton Co., U.S.D.A. 110.
New Jersey, Freehold area, 110.
North Carolina, Person Co., U.S.D.A. 13.
Oregon, Marion Co., U.S.D.A. 109.
Wisconsin, Trempealeau Co., U.S.D.A. 506.
Wisconsin, Vernon Co., U.S.D.A. 655.
Wisconsin, Winnebago Co., U.S.D.A. 109.
survey—
method and purpose, Mont. 212.
of Kona district, Hawaii 366.
State, notes, Md. 506.
temperature in greenhouses, 244.
temperature studies, Calif. 504.
types, responses to fertilizers, 18.
water, *see* Soil moisture.

Soils—
acid—*see also* Soil acidity.
effect on availability of phosphates, Wis. 657.
arid, effects of irrigation and alfalfa production, 16.
base-exchange reactions, equilibria, 14.
buffer action, factors affecting, Del. 506.
buffer capacity, Tex. 111.
calcareous, rôle of chalk in, 18.
carbon dioxide production in, determination, Iowa 106.

Soils—Continued.
classification for use in soil survey, 211.
colloidal fraction, mineral constituents, 655.
desert, studies, Nev. 367.
drying, acidity and exchangeable bases, 14.
electrodialyzable ions liberated from, 13.
expressed liquids, pH and phosphorus in, 15.
fertilizer requirements, determination, Ind. 505.
formation, behavior of potassium and sodium in, Mo. 216.
heating by electricity, 175, 829; Calif. 605.
H-ion concentration, effect of air drying, U.S.D.A. 111.
inoculation, *see* Legumes, inoculation.
lime requirements, determination, N.H. 653.
loess, of North China, pH values, 15.
manipulation, effect on structure, 323.
marsh, *see* Marsh.
microchemical tests, Conn.State 105.
moor, *see* Moor *and* Peat.
muck, *see* Muck soils.
nitrogen content, *see* Nitrification *and* Nitrogen.
of Calhoun County, Ill. 506.
of Chehalis series, utilization, Oreg. 655.
of dry regions, classification, organic matter as factor, 657.
of Everglades, studies, Fla. 505.
of Fayette County, Ill. 506.
of India, effect of alkali salts on nitrification, 218.
of Montana, phosphate deficiency, Mont. 370.
of Texas, chemical composition, Tex. 109.
organic matter in, *see* Organic matter.
peat, see Moor *and* Peat.
pH value, antimony electrode for determining, 203.
plasticity number, relation to clay content, Mo. 367.
replaceable bases and effect of lime, 215.
replaceable bases in, apparatus for determining, 106.
sandy loam, potash-lime deficiency in, 250.
semiarid, organic matter changes in, 219.
sorption phenomena in, 110.
sterilized greenhouse, reinoculation, Ohio 35.
studies, Calif. 504; Conn.State 504; Hawaii 366; Ohio 16; R.I. 214; Wyo. 16.
uronic acid complexes in, 16.

Soils—Continued.
- vertical expansion after spading and hoeing, 79.
- water flow in, coordination of research, 322, 323.

Solar—
- energy, heating water by, 608.
- radiation, and pellagra in southern United States, 488.
- radiation, variations in, effect on weather, U.S.D.A. 10.
- variations, periodicities, device for study, 654.

Solenopsis geminata, *see* Fire ants.

Solutions, nutrient, *see* Culture media.

Sore mouth in sheep and goats, Tex. 740.

Sorghum—
- bacterial leaf spot, 548.
- culture experiments, Nebr. 517.
- grain—
  - breeding, Calif. 516; Tex. 668.
  - culture experiments, Tex. 668.
  - *feeding value*, Tex. 723.
  - inheritance studies, Tex. 515, 668.
  - v. corn for grain and forage, Mo. 378.
  - varieties in California, Calif. 516.
  - variety tests, La. 123, 233; Mo. 378; N.Mex. 29; Tex. 668; U.S.D.A. 28.
- *grass, chromosomes in*, 374.
- multiple seeded spikelets in, Tex. 520.
- planting and spacing tests, U.S.D.A. 30.
- residues, effect on crop yields, 31.
- rust, varietal susceptibility, 697.
- seed, low germination in, cause, 522.
- seed treatment, Tex. 668.
- seed treatments with dry soil conditions, Okla. 270.
- v. corn for grain and silage, Miss. 29.

Sorgo—
- and kafir as forage crop, U.S.D.A. 30.
- breeding, Tex. 668.
- culture experiments, Tex. 668.
- variety tests, Fla. 516; Iowa 378; La. 123, 233; N.Mex. 29; Nebr. 517; Tex. 668; U.S.D.A. 28, 30.

Sorosporium—
- *paspali*, notes, 403.
- *reilianum*, physiology and cytology, 544.

South Carolina Station, notes, 96.

South Dakota Station, report, 94.

Sows—*see also* Pigs.
- brood, calcium requirement, Mo. 590.
- Brucella-reacting, exposing *cows* to, 71.
- dressed yields, Ohio 58.
- production, 60.

Soybean—
- and *corn rations, effect of yeast and* casein supplements, 295.
- bacterial pustule, studies, 548.
- hay, artificial drying, 528.
- hay, artificially dried, digestibility, La. 295.

Soybean—Continued.
- hay for milk and butterfat production, Ind. 593.
- hay yield and cost per acre, Md. 613.
- milk and whole milk, dietary properties, comparison, 481.

Soybeans—
- *amino acid deficiencies, for growth in* rats, 627.
- and corn, intercropping, La. 233.
- and corn, production with mechanical power, La. 322.
- as *green manure for surgarcane plan*tations, 672.
- as hay crop, N.J. 379.
- *as supplement to corn*, Ind. 589.
- breeding, La. 233; Mo. 378.
- carbohydrate-nitrogen relation, effect of fertility, 660.
- culture experiments, La. 233; N.Mex. 29; Nebr. 517; Ohio 517.
- for hay and seed, variety tests, Md. 517.
- for hay, varieties and strains, N.J. 123.
- germination, reduction due to damage during threshing, Ohio 29.
- oil tests for, U.S.D.A. 84.
- variety, seeding, and utilization studies, Ind. 517.
- variety tests, Iowa 378; La. 28, 123, 233; Mass. 378; Miss. 29; Mo. 378; N.Mex. 29; Nebr. 517; Ohio 517; Tex. 668; Va. 668; Wyo. 30.
- variety-date-of-planting tests, Fla. 516.
- weed control in, Ohio 75.
- with corn and with Sudan grass, tests, Ohio 517.
- yields, Ind. 667.

Spectral energy distribution, measurement, 608.

Spermatozoa—
- migration through cervix, 232.
- motility, energy of, 121.

Sphaceloma—
- *fawcetii*, notes, 47.
- *symphoricarpi* of Snowberry, 703.

Sphenoptera gossypii, notes, 286.

Spider mite, *see* Red spider.

Spiders, red, *see* Red spider.

Spilocryptus extrannulatus, notes, 571.

Spilographa electa, notes, 564.

Spilographa setosa, notes, 705.

Spilonota ocellana, *see* Bud moth, eye-spotted.

Spinach—
- canned, pellagra-preventive value, 488.
- copper and manganese in, relation to mineral additions to soil, 775.
- fertilizer experiments, Ill. 66.
- iron in, U.S.D.A. 65.
- leaf deformation, 545.
- leaf miner, treatise, 291.
- New Zealand, methods of germinating, 522.
- response to change in photoperiod, 248.

Spinach—Continued.
varieties, vitamins in, 630.
variety tests, Conn.State 523.
Spirochaetosis of pigs, 452.
Splitworm, a tobacco insect new to Wisconsin, Wis. 706.
Spondylocladium atrovirens, notes, 407.
Spongospora subterranea, notes, 696.
Sporotrichum—
citri, notes, 47, 400.
schenckii, transmission to plants and animals, 599.
Spray—
baits, attraction of insects to, 564.
injury on apples, factors affecting, 425.
nonarsenical, for cabbage moth control, 152.
residue—
arsenical, effect of sprinklers, 425.
arsenical, on apples, Conn.State 523; Ind. 523; N.H. 527; N.Mex. 35.
arsenical, on cherries, Oreg. 681.
arsenical, Pennsylvania State dedepartment of agriculture check up, 561.
arsenical, removal, 423, 425, 560; Idaho 254; Ind. 673; N.Y.State 526.
arsenical, tolerance, 560.
problem, 427; Mass. 424; N.J. 524.
removal, future of, 561.
schedule for 1932, 560.
schedules—
defects in, 427.
for fruits, N.J. 38; Ohio 38.
for northwest, 283.
service, N.H. 560.
Sprayer, air-blast type, efficiency, 705.
Spraying—*see also* Dusting *and specific crops*.
and dusting experiments, 410; Ind. 523.
experiences, 560.
materials, cost and quantity, 425.
materials, tests, Ohio 36.
methods, comparison, Mich. 526.
modern developments, 561.
operations, hazard from power lines during, 705.
outfits, portable and stationary, cost study, Ind. 673.
plant, stationary, power consumption, Ind. 605.
plants, stationary, survey, 329.
problems from new angles, 427.
Sprays—*see also* Fungicides, Insecticides, *and specific forms*.
copper, *see* Copper.
dormant oil, for pear psylla, N.Y. State 710.
for ornamental evergreens, tests, N.J. 561.
oil, *see* Oil sprays.
recommendations for Idaho, 283.
Sprays—Continued.
tar distillate, efficiency, 708.
Springtails—
injurious to alfalfa, 429.
on mushrooms, biology and control, 565.
Spruce—
blighting by *Phacidium* sp., 557.
in New Zealand, enemies of, 569.
Norway, seedlings, mycorrhizae on roots, 373.
red, alcohol separation of empty seed and effect on germination, 41.
seed beds, damping-off in, effect of superphosphate, 41.
Spuler, A., necrology notes, 192.
Spurge, leafy, spread and eradication, Iowa 378.
Squash—
borer control, spray formulas, N.Y. State 714.
bug, notes, N.Mex. 50.
Squashes—
breeding and selection, N.Dak. 673.
California, composition and time for cooking, 770.
canning tests, Ind. 523.
Hubbard, development of cotyledons, 676.
seed improvement studies, Mass. 386.
variety tests, Conn.State 523.
Squirrels—
American gray, in the British Isles, treatise, 148.
ground, action of strychnine on, Colo. 148.
Stachybotrys kiebahni, notes, 690.
Stachytarpheta, spiked leaves, intracellular bodies in, 264.
Stalk rot, effectiveness of vaseline, 608.
Stamoderes uniformis on apple, Calif. 559.
Standards of living—
of farm families, Mont. 637; Nebr. 190.
of farm families, diet as index, Utah 781.
of farm families, effect of income, N.Dak. 767.
Staphylococcus—
albus, notes, 746.
aureus in respiratory tract and middle ear of rats, 491.
pyogenes aureus, notes, 75.
Starch—
of oats and barley, digestibility, Calif. 588.
pastes, physical properties affecting stiffening power, U.S.D.A. 349.
structure and composition, 472.
Starches, heat of hydration, 357.
Starters, preparation for creameries and cheese factories, Oreg. 736.
Steers—*see also* Cattle, beef.
corn in silage v. shelled corn for, Ohio 58.
fattening, number of feedings, Wis. 723.

Steers—Continued.
  fattening, roughages in rations, Tex. 723.
  feeder, grades, Tex. 723.
  feeding experiments, N.Dak. 722.
  wintering, cost, Fla. 588.
Stemphylium—
  congestum minor n.v. on apples, 699.
  sp. on tomatoes, 551; Fla. 535.
Stephanoderes hampei in Java, 156.
Stephanopholis philippinensis, notes, 562.
Stephanurus dentatus—
  life cycle, 456.
  notes, 602.
  summary, 74.
Sterility in fruits, 39.
Sterility in ragi, 26.
Sterol X, properties, 201.
Stink bug—
  litchi, control, 431.
  southern green, egg parasite, 442.
Stock, *see* Livestock.
Stock foods, *see* Feeding stuffs.
Stocks, breeding, Calif. 525.
Stockyards fever, *see* Septicemia, hemorrhagic.
Stomach—
  preparations, vitamin B (B_1) and G (B_2) in, 187.
  worms in lambs, control, Ind. 596; U.S.D.A. 168.
  worms in sheep and goats, Tex. 168.
  worms in sheep and goats, control methods, comparison, 601.
  worms in sheep, control, 72, 601; Tex. 740; U.S.D.A. 168.
Stomatitis, vesicular—
  and foot-and-mouth disease, 167.
  passive immunization of small animals in, 454.
Storages—
  air-cooled, construction and management, Mich. 611.
  natural and cool air, Iowa 385.
Strawberries—
  analyses and handling qualities, effect of fertilizers, 674.
  as source of yeast and molds in ice cream, Nebr. 594.
  breeding, Conn.State 523; N.J. 524.
  breeding, best parents in, 682.
  culture in Louisiana, 394.
  Dunlap, fruit bud differentiation, 136.
  fertilizer experiments, 259, 388; La. 130; Md. 524; N.H. 524.
  firmness and flavor, effect of fertilizers, 393.
  flower production and yield, effect of age of plant, 682.
  fruit bud differentiation, relation to age and position of plant, 394.
  fruit bud formation in, Mass. 386.
  insects affecting, Mo. 424.
  irrigation experiments, Tex. 674.
  length of fruit developmental period, N.J. 524.
  market diseases, U.S.D.A. 146.
Strawberries—Continued.
  Missionary, cold storage studies, Fla. 523.
  propagation, variety, and culture tests, La. 130.
  respiration intensity relation to fertilizers, 393.
  transpiration in, 393.
  varieties, length of fruit development period, 394.
  varieties, promising, 258.
  varieties, root and top development, comparison, 259.
  winter hardiness trials, Wis. 674.
Strawberry—
  black root, studies, Mich. 46.
  chlorosis, noninfectious, nature, N.J. 524.
  crown moth, life history and habits, Oreg. 712.
  disease in Lanarkshire, 555.
  diseases, La. 143, 263.
  diseases important in Florida, Fla. 535.
  French bud, crimps, or brier bud disease, Fla. 535.
  gold disease, notes, Mass. 399.
  leaf roller, biology and habits, 570.
  Rhizoctonia disease, control, Oreg. 276.
  Verticillium wilt, Calif. 554.
Street and highway intersections, design, U.S.D.A. 754.
Streptococcus—
  and Leuconostoc species, differentiation, N.Y.State 224.
  relation to milk-borne infection, 313.
Streptococcus epidemicus—
  filtrate, intradermal injection, 312.
  in cows, Wis. 740.
Struthanthus concinnus on bamboos in Brazil, 557.
Strychnine for control of ground squirrels, Colo. 148.
Stumpage and log prices for 1930, U.S.D.A. 137.
Sudan grass—
  as hay crop, N.J. 379.
  as pasture crop, Tenn. 129; U.S.D.A. 30.
  as pasture for cows, Ohio 30, 380; S.Dak. 158.
  culture experiments, N.Mex. 29.
  in rotation, effect on corn yield, Iowa 378.
  tillering in, Tex. 668.
Sugar beet—*see also* Beet.
  Cercospora leaf spot and minor diseases, Iowa 399.
  curly top attenuated virus, restoration of virulence, 549.
  curly top, attenuation of virus, 271.
  curly top, studies, N.Mex. 29.
  damping-off, delayed thinning as means of control, 549.
  dry-rot canker, studies, 549.
  machinery, development, 610.
  root rot, new, 697.

Sugar beet—Continued.
seed, annual production studies, N.Mex. 29.
Sugar beets—
breeding, Calif. 516; La. 283.
culture experiments, Wyo. 31.
fertilizer experiment, analysis of variance illustrated in, 672.
fertilizer experiments, 123, 124; Ohio 30; Wyo. 31.
field experiments, size and shape of plat in, 521.
irrigation requirements, Can. 463.
planting season, Calif. 381.
sampling technic, 520.
seedling color and yield, 34.
storage studies, 230.
variety tests, 31; Tex. 668.
washing and halving for sugar and purity determinations, 672.
Sugar—*see also* Sugars.
for increasing palatability of swine rations, Hawaii 444.
in blood, *see* Blood sugar.
Sugarcane—
bacterial red stripe in the Pacific countries, 271.
beetle, studies, La. 283.
borer, control, 156; La. 283.
borer, control and status, 714.
borer, control in Barbados, 154.
borer damage, effect of colonization of parasites, 57.
borer parasites, collecting in South America, 57, 714.
borer parasites, receiving in Louisiana, 57.
breeding, Fla. 516.
burned, harvesting, 240.
culture, deficiencies of agricultural implements, La. 322.
diseases, 400.
effect of soil reaction, La. 233.
experiments, P.R. 517.
fertilizer experiments, Fla. 516; La. 233.
fertilizer experiments in Puerto Rico, 521.
froghopper blight in Trinidad, 151.
gumming and leaf scald, 271.
gumming disease, summary, 263.
insects affecting in Philippines, 562.
juices, phosphoric acid in, precipitation, P.R. 500.
leaf spot, notes, 265.
milling and freezing, La. 322.
mosaic, control in various countries, 549.
mosaic in India, 408.
mosaic, mechanical transmission, 272.
mosaic, method for artificial transmission, 142.
mosaic, relation to new varieties, P.R. 549.
mosaic, studies, 399, 408; La. 263.
mosaic-like condition, 263.
Sugarcane—Continued.
moth borer parasites, rearing and distribution, modifications, 443.
moth stalk borer, prevalence and control, Fla. 559.
pests, 286.
pests in Queensland, 150.
pineapple disease, studies, 265.
pokkah boeng, studies, La. 263.
pollen, longevity, 374.
pollen shedding, 240.
root development, La. 233.
root rot and red rot, studies, La. 263.
root rot, factors responsible for, 272.
rootstock weevils, La. 283.
top rot, different forms, 272.
varieties, analyses, P.R. 500.
varieties, improvement, 120.
varieties, new, data on, P.R. 34.
variety P.O.J. 2878, gummosis in, 272.
variety tests, Fla. 516; La. 233; Miss. 29.
wagons, draft, La. 322.
Sugars—*see also* Glucose, Lactose, *etc.*
combination of for control of sandiness in ice cream, 69.
in biological fluids, Molisch reactions in study, 207.
in corn tissues, determination, 208.
in plant extracts, determination, N.H. 653.
oxidations induced by, 198.
Sulco V. B., spraying tests, 400.
Sulfate of ammonia, *see* Ammonium sulfate.
Sulfates, action on Portland cement, 753.
Sulfur—
and sulfur compounds as fungicides, Tex. 690.
as insecticide, Tex. 705.
chemistry of toxic factor, 540.
compounds, soluble organic, new color reaction, 8.
dioxide injury to plants, 386.
fungicidal action, 401.
metabolism, effect on pathologic effects of solar irradiation, 488.
mixtures—*see also* Lime-sulfur.
adhesiveness, 540.
oxidation, 19.
spray injury, comparison, Mo. 386.
sprays, use in hot weather, caution, Wis. 690.
Sulfuric acid for destruction of weeds in growing grain, 610.
Summers, warm and cool, prediction in east Hungary, 210.
Sun spots and precipitation in north Germany, correlations, 108.
Sun yards and sun porches for chickens, Ohio 303.
Sunflower leaves, change of substances in during vegetation, 372.
Sunlight—*see also* Light.
daily, intensity, measurements, 20.
effect on cattle, S.Dak. 65.

Sunlight—Continued.
of Texas, effect on durability and color of cotton fabrics, Tex. 781.
winter, in Chicago, behind ultra-violet glass, antirachitic efficiency, 490.
Sunshine—
antirachitic effect, seasonal variation, 490.
of Arkansas, antirachitic potency, seasonal variation, 780.
Superphosphates, effect on damping-off in seed beds of evergreens, 41.
Suricat, new nematodes from, 70.
Surra—
prophylaxis, 450.
transmission by land leech, 743.
treatment in Philippines, 169.
Swamp fever in horses, 450, 451; Wyo. 70.
Swede dry rot, cause, 409.
Swedes, types, tests, 31.
Sweet corn—see also Corn.
bacterial wilt and smut, 544.
breeding, Conn.State 523; Fla. 516; Iowa 385; N.H. 524; Ohio 524; P.R. 525; Tex. 668; Wis. 674.
breeding and selection, N.Dak. 673.
cost of production, N.J. 613.
fertilizer experiments, cooperative, N.J. 524.
hybrid, uniformity of maturity and size of ears, 248.
response to fertilizers, 36.
response to varying temperatures, U.S.D.A. 675.
variety tests, R.I. 244.
Sweet peas—
experiments with, N.Mex. 35.
photoperiodic response, 261.
thinning, Ohio 36.
Sweetclover—
analyses, American and European methods, 522.
as pasture crop for dairy cows, S.Dak. 158.
biennial, eradication, Iowa 378.
breeding and genetic studies, Wis. 668.
culture experiments, Ohio 517.
cutting tests, Ohio 517.
damaged, effect on blood coagulation, 316.
disease, N.Dak. 739.
hulled v. unhulled, culture experiments, Tex. 668.
pollinating agents, S.Dak. 51.
screenings, composition, N.Dak. 667.
second-year, sheep-carrying capacity, Ohio 58.
seed, scarified and unscarified, value, 522.
seeding tests in winter wheat, Ohio 240.
v. clover, comparison, Ohio 80.
variety tests, Mass. 378; N.Dak. 667; Ohio 517; Wyo. 81.
white, softening of seeds, 521.
yields, effect of drought, Ohio 80.
Sweetfern blister rust of pitch pines, U.S.D.A. 148.
Sweetpotato—
diseases in Virginia, control, Va.Truck 409.
of Puerto Rico, mutations, La. 233.
scurf, notes, 544.
seed stock, disease-free, propagation, Iowa 399.
stem rot, control, 550.
storage houses, heating and ventilating, 330.
Sweetpotatoes—
as supplementary feeds for poultry, Hawaii 302.
California, composition and time for cooking, 770.
culture, Ga.Coastal Plain 381.
curing, V.I. 525.
feeding value, La. 295.
fertilizer experiments, Ga.Coastal Plain 381; La. 130, 233.
ipomoein from, 3.
paper mulch test, Fla. 516.
storage studies, V.I. 518.
variety tests, Mo. 378.
vitamin A in, Mo. 480.
vitamin A in, effect of fertilizers, Iowa 473.
Swellhead in sheep and goats, Tex. 740.
Swine—see also Pigs.
breeding, Mo. 376.
diseases in Kenya, 73.
diseases, relation to feeds, 450.
erysipelas, causative organism, isolation, 456.
litter size, effects of nutrition and heredity, 587.
post-vaccination problems, 168.
Sylviidae of New Jersey, N.J. 49.
Symbiosis of animal and plant, 284.
Symptomatic anthrax, see Blackleg.
Synchytrium endobioticum, notes, 408, 548.
Tabanidae of Minnesota, Minn. 574.
Tachypterellus—
consors cerasi, new subspecies, Colo. 718.
quadrigibbus magna, new subspecies, Colo. 718.
Tachypterellus, study of genus and new subspecies, Colo. 718.
Taeniothrips gladioli—
control, 705.
n.sp., description, 769.
notes, Ohio 50.
Tankage—
and alfalfa supplement to hogging down corn, Mont. 300.
feeding value, La. 295.
Tapeworms—
effect of embelin, 597.
in poultry, kamala as anthelmintic, 746; Ohio 69.
in poultry, treatment and prevention, 461.
in sheep and goats, control, 602.

Tapeworms—Continued.
 in turkeys, kamala for, N.Dak. 739
Tar distillate—
 sprays, efficiency, 708.
 washes for capsid bug control, 284.
Tariff duties, source, 469.
Tariffs, foreign, handbook, 335.
Tarnished plant bug—
 feeding punctures and effect on cotton, U.S.D.A. 288.
 on celery, control, 709.
 relation to alfalfa seed production, Utah 287.
 studies, 425.
Taros, fertilizer experiments, P.R. 517.
Tarsonemus pallidus, control on strawberry, 559.
Tartaric acid, titration in presence of ferric and cupric salts, 203.
Taxation—
 adjustments necessary in, 470; U.S.D.A. 614.
 farm, in New Jersey, N.J. 81.
 forest, in North Carolina, U.S.D.A. 181.
 forest, State laws of 1932, digest, U.S.D.A. 615.
Taxes, ratio to net income on rented farms, Tex. 757.
Tea diseases, notes, 401.
Teak pests, 562.
Teak timber, insect damage, 287.
Teeth—
 decay experiments, failure in, 480.
 decay of children, effect of diet, 341.
 decay, present-day theories, 480.
 mottled enamel in, cause, 93.
 tissues, nutritional channels, 479.
Temperature—*see also* Climate *and* Soil temperature.
 body, in rats on normal and deficient diets, 477.
 subsoil, seasonal variations, 367.
Tennessee Station, notes, 495.
Tent caterpillar, eastern, notes, 563.
Teosinte hybridization, studies, Tex. 513.
Termites, notes, 426.
Termites of British Columbia, 284.
Terracing machinery, Mo. 462.
Tessaratoma papillosa, control, 431.
Testicles, transplantation experiments, 27.
Tetrachlorethylene and carbon tetrachloride, comparison, 452.
Tetracnemus pretiosus, description and biology, Calif. 432.
Tetrameres americana of poultry, intermediate host for, 288.
Tetranychus—
 bimaculatus n.sp., control, Mich. 57.
 mcdanieli n.sp., control, Mich. 57.
 mcdanieli, new mite on raspberries, 443.
 pacificus, notes, Calif. 559.
 telarius, *see* Red spider.
Tetrastichus sp., notes, Colo. 719.
Tetropium gabrieli, notes, 684.
Texas—
 fever, *see* Piroplasmosis.
Texas—Continued.
 Station, abstracts of publications, 638.
 Station, report, 782.
Textile plants, microbiological retting, status, 93.
Textile research, Iowa 492.
Textiles—
 and clothing, textbook, 349.
 fastness to light and washing, Ohio 93.
Thallium, effect on tobacco growth, 511.
Thaumetopoea processionea in Pieve forests, 285.
Theileria—
 annulata, notes, 743.
 parva in *Rhipicephalus appendiculatus*, life cycle, 314.
 spp., notes, 600.
Theobaldia annulata, oviposition, 284.
Theobroma bicolor, notes, 399.
Thielaviopsis—
 ethaceticus, notes, 265.
 paradoxa, notes, 147.
 sp., notes, 400.
Thiocyanates, aliphatic, insecticidal value against aphids, 53.
Thistle, Canada, control with chlorate sprays, Ohio 29, 30.
Threshing—
 machine, power requirements, Ohio 75.
 with electricity, Ind. 605.
Thrips—
 attacking cherries, Calif. 559.
 dissemination of bean bacterial disease by, 51.
 on carnations, N.J. 561.
 relation to alfalfa seed production, Utah 287.
Thrips tabaci, *see* Onion thrips.
Thymus—
 and bursa extirpation in pigeons, effect, 122.
 and reproduction, relation, 122.
 relation to growth, Fla. 620.
Thyridopteryx, commercial use for, 50.
Thyroid—
 administration, effect on anorexia, 633.
 gland, colloid degeneration of, effect, 596.
Thyroxine, effect on fat distribution and quantity in rats, 773.
Thysanoptera—
 attacking cereals, 284.
 of China, 430.
 of Europe, 567.
 of France, 288.
Tick fever, *see* Piroplasmosis.
Tick fever, Rhodesian, *see* African coast fever.
Ticks—*see also* Fowl tick.
 in Kenya Colony, 294.
 in Palestine, 313.
 infestation in coastal tract of North Kanara District, 450.
 infesting a house in Canal Zone, 294.
 sheep, control, 576.
 survey in Kenya, 452.

Tile drains, efficiency, effect of joint space, Ohio 75.
Tillage—
deep, value, Wis. 657.
experiments, N.Dak. 667.
machinery, N.J. 605.
Timber—*see also* Lumber *and* Wood.
Indian, preservation by open tank process, 174.
Timothy—
hay and oat feed for dairy cows, Wis. 731.
hay for wintering ewes, Ohio 58.
strains, reaction to *Ustilago striaeformis*, 697.
varieties and strains, N.J. 123.
variety tests, N.J. 517.
Tineola bisselliella—
length of adult life, 54.
predator of tick larvae, 284.
Tirathaba rufivena, importance and control, 433.
Tissue reactions in vitamin deficiency, 189.
Tissues, glycogen in, 207.
Tmetocera ocellana. *see* Bud moth, eye-spotted.
Tobacco—
angular leaf spot and black fire, differentiation, 550.
beetle in fermentative factories, biological cycle, 717.
black and brown root rot, notes, Mass. 399.
black shank control, progress in, 550.
black shank in Puerto Rico, 550.
blue mold disease, infection experiments, 409.
blue mold in Western Australia, 409.
breeding, Md. 517.
cigar leaf, experiments, Conn.State 381, 383.
critical growing period, Conn.State 516.
curing by artificial heat, Wis. 669.
diseases, Fla. 550; P.R. 550.
Ephestia elutella affecting, 435.
fertilizer experiments, Fla. 516; Ind. 667; Md. 517; Ohio 29.
frenching disease, Conn.State 383.
growth, effect of thallium, 511.
insects affecting, 150.
leaves, change of substances in during vegetation, 372.
mosaic disease, virus precipitation, 697.
mosaic, local symptoms in leaves of some species, 550.
mosaic, notes, 264.
mosaic virus, cultivation in vitro, 273.
pest in Crimea, 715.
potash requirements, Conn.State 381.
production in New England, history, Conn.Storrs 180.
protecting from grasshoppers, 709.
rotation experiments, Md. 517.
seed, germination, Wis. 669.
seed, nutritive properties, 621; Conn. State 580.
Tobacco—Continued.
seed, root rot resistant strains, Conn. State 516.
seedlings, disease affecting, 550.
stored, pests of, 565.
studies, Mass. 378.
tests, Tex. 668.
thrips fauna in Crimea, 151.
virus diseases, purification of virus fraction, Mo. 409.
White Burley character in, inheritance, 515.
wildfire, control, seed bed management in, Pa. 45.
Tomaspis saccharina in Trinidad, oviposition, 151.
Tomato—
bacterial canker, 274, 550; Utah 698.
blight, late, control, Tex. 690.
cross, fertile tetraploid, studies, 514.
diseases, Ind. 536; Mich. 143; Tex. 690.
foliage, composition, effect of fertilizers, 387.
gall nematode, effect of environment, 273.
leaf and leaflet cuttings, regenerative capacities, 37.
leaf mold, control, Ohio 43; Wis. 690.
leaf roll, notes, 264.
mosaic plants, separation of toxins from, 697.
mosaic virus, purification and properties, 697.
nailhead spot, Fla. 535.
pistils, histological study, 142.
plants, absorption of nitrogen by, N.J. 508.
plants, holding in pots after reaching planting size, effect, Ohio 524.
plants, large overgrown, use, Ohio 36.
pockets, effect of fertilizers, Tex. 673.
puff, nature of, Tex. 673.
ripe rot, effect of radiant energy, 409.
root knot, control, 273.
seedlings, damping-off, causes and control, Ohio 43.
spotted wilt, new hosts, 551.
spotted wilt, transmission, 430.
Stemphylium leaf spot, 551.
Verticillium wilt, factors affecting, Ohio 43.
wilt resistant varieties, development, Tex. 673.
wilt resistant varieties, selection, Ind. 523.
wilt, studies, La. 263.
worm, studies, Mich. 433.
yellows under different light conditions, 274.
Tomatoes—
analyses and handling qualities, effect of fertilizers, 674.
anthesis and blossom drop, relation to temperature, 142.
Break o' Day, origin and characteristics, U.S.D.A. 257.

Tomatoes—Continued.
breeding, N.H. 524; N.J. 524; Tex. 673.
breeding and selection, N.Dak. 673.
calcium nutrition, N.J. 524.
canned, color, effect of sterilization, Ind. 523.
cannery, marketing, Ohio 80.
carotenoid content, relation to light, 245.
cost of production, N.J. 613.
culture experiments, N.Mex. 35.
effect of ethylene treatment, 244.
effect of hours of sunshine and heating the soil, 244.
fertilizer experiments, Ill. 36; Miss. 35; Mo. 386; Tex. 674.
for canneries, cost and returns to growers, Ohio 470.
forcing experiments, R.I. 244.
greenhouse, Cladosporium leaf mold of, control, 551.
greenhouse, culture, Ohio 132.
greenhouse, inflorescence and fruiting habits, N.Y.Cornell 676.
greenhouse, yield, effect of leaf pruning, 249.
improvement, Calif. 526.
inheritance of fruit size and shape, Iowa 385.
market diseases, identification, U.S.D.A. 405.
marketing by grade, Ind. 613.
methods of watering, 246.
narcotine in, 649.
nitrogen sources, 246.
paper mulch experiments, 246.
plat technic trials, Tex. 673.
potted v. trowel-set, Ohio 35.
response to fertilizers, 36.
rogues in, genetics and cytology, 514.
selection studies, Mo. 386.
soil preparation and fertilizers for, Mich. 87.
spacing, Tex. 674.
stored, pectin changes in, Iowa 385.
strain tests, Ohio 524.
variety and strain tests, 246.
variety tests, Conn.State 523; Tex. 673.
vitamin B (B_1) in, 634.
vitamin B complex in, 632.
yields, Md. 523.
Topeutes intacta, notes, 562.
Tortrix—
excessana, injury to spruce, 569.
viridana in Pieve forests, 285.
Torulin, function, 634.
Toumey, J. M., necrology, notes, 351.
Toumeyella liriodendri, notes, 566.
Toxoptera graminum, see Grain aphis, spring.
Tracheitis infections of fowls, Iowa 450.
Tracheobronchitis, infections, of fowls, 746.
Tractor—
design, gear loading practice, 326.
Tractor—Continued.
engines, economic use at part loads, 326.
stop hitches, studies, 327.
track efficiency, Iowa 402.
Tractors—
and internal-combustion engines, treatise, 326.
charcoal gas fuel for, 609.
costs, Mo. 462.
drawbar power costs, Ind. 613.
farm, in Minnesota, Minn. 78.
wheel and crawler type, 78.
Traffic survey of western States, U.S.D.A. 77.
Trametes—
hispida, destructive in apple orchards, 699.
peckii, destructive in apple orchards, 699.
pini, notes, U.S.D.A. 280.
Transpiration—
in new and old raspberry canes, 530.
rates of citrus leaves, 684.
studies on strawberries, 393.
Tranzschelia punctata, notes, 701.
Trap nest, two types, plans and specifications, N.J. 612.
Trees—
coniferous, see Conifers.
deciduous, tests, Nebr. 524.
Delta hardwood, volume determinations, planimeter method, 688.
for control of erosion, tests, Iowa 398.
forest, premature seed germination during natural storage in duff, 534.
forest, studies, Ohio 583.
forest, volume tables, procedure and technic, U.S.D.A. 688.
hardwood and coniferous, mixed stands, rabbit injury in, N.H. 533.
hardwood forest, drying rate of leaves, 686.
hardwood, seedling analysis in field, inaccuracy, 534.
in northwest Texas, Tex. 262.
nutrition problems, direct injection for study, N.Y.State 250.
shade, insects affecting, 51, 565.
stimulative effect of illuminating gas, 510.
tests, Tex. 673.
tolerance to insecticides, 566.
volume tables, method of constructing, 534.
windbreak, in prairie region, establishment, growth, and effect, Minn. 687.
Trematode requiring four hosts, 283.
Trialeurodes vaporariorum, see White fly, greenhouse.
Triatoma geniculata, notes, 461.
Tribolium confusum, see Flour beetle, confused.
Trichloracetic acid, effect on nitrogen and phosphorus determinations, 205.
Trichoderma sp., notes, La. 268.

Trichogramma minutum—
  behavior in field liberations, 583.
  colonization, effect on sugarcane borer damage, 57.
  distributing, Conn.State 559.
  field colonization, 156.
  mass breeding in Barbados, 154.
  mass liberations, results, 583.
  rearing and distribution, modifications, 443.
Trichogramma parasites in orchards, 705.
Trichogrammatid egg parasites, new, descriptions, 443.
Trichostrongylus colubriformis in jack rabbits, 749.
Trichothecium roseum, relation to *Cephalothecium roseum*, 275.
Trimethylene glycol, bacteria producing, 661.
Trinity mixture v. other protein supplements for hogs, Ohio 58.
Trionymus sacchari—
  biological control, 53.
  notes, 562.
Trioza spp., notes, 284.
Tripsacum and corn crosses, studies, Tex. 513.
Triticum and Aegilops crosses, cytological studies, 119.
Tritoxa flexa, notes, 705.
Trochorrhopalus strangulatus, notes, 562.
Trogaspidia minor, notes, 562.
Tropisternus collaris, intermediate host of thorny-headed worm, P.R. 597.
Truck *crops*—
  diseases in Vale of Evesham, 405.
  insects affecting, 423, 560; Ill. 150.
  protecting from grasshoppers, 709.
Trucks, *see* Motor trucks.
Trypanosoma cruzi, notes, 431.
Trypanosoma paddae, notes, 743.
Trypanosomiasis—
  control, papers on, 70.
  human, in Panama, 431.
  in canaries, behavior and transmission, 743.
Tubercle bacilli—
  excretion from udder, 313.
  variability, 599.
Tuberculin—
  avian, specificity of reactions, 74.
  possession and use, restrictions, 450.
  tests, intradermal, of cattle with necropsy findings, 450.
Tuberculina maxima for control of white pine blister rust, 48.
Tuberculosis—
  avian, control, 167, 461; N.Dak. 739.
  avian, in cattle, 450.
  bone, in children, vitamin D in, 88.
  bovine, in man, infection by milk, 455.
  causative organism, recent research, 455.
  chemotherapy, 769.
  eradication, calf segregation method, 450.
  eradication work, cooperative, 455.
Tuberculosis—Continued.
  immunization with B.C.G. vaccine, 167, 316; Calif. 595.
  in goats in India, 745.
  in swine, 596.
  no-lesion reactors in, Wis. 740.
  of turkeys, 749.
  pulmonary, effect of dietary measures, 489.
  skin, of cattle, bacteriology, 315, 455.
Tularemia in sage hen, 455.
Tulip bulbs, dormancy, breaking, 398.
Tulip tree scale, control, 566.
Tung-oil trees, propagation and culture, Fla. 523.
Turf production, fertility factor in, 235.
Turf studies, N.J. 517.
Turkey—
  disease in Maryland resembling fowl cholera, 605.
  eggs, hatching, Nebr. 447.
  eggs, weight loss, variations and growth rates of poults, Nebr. 589.
Turkeys—
  Bronze, raising, N.Dak. 722.
  chromosome studies, 24.
  effect of varying amount of protein in rations, Mich. 64.
  protein requirements, Ind. 589.
  raising in confinement, Okla. 303.
Turnip—
  aphid, control, Tex. 705.
  bacterial spot, 548.
  greens, canned, pellagra-preventive value, 488.
  greens, canned, vitamins in, 88.
  greens, iron in, U.S.D.A. 86.
Turnips—
  California, composition and time for cooking, 770.
  vitamin B complex in, 343.
Turpentine, gum spirits of, fractionation, U.S.D.A. 9.
Twig girdler, notes, Fla. 559.
Twins, conjoined, differences, 232.
Tylenchinema oscinellae, nematode parasite of frit fly, 292.
Tylenchus musicola from diseased banana roots, 277.
Typhlocyba—
  comes, see Grape leafhopper.
  pomaria, studies, 709; Va. 51.
Typhoid, avian, *see* Fowl typhoid.
Typhula graminum, pathogenicity, 403.
Typhus fever—
  endemic, rat flea as vector, 438, 577.
  endemic, transmission, 282, 722.
  endemic, transmission mechanism, 438.
  virus in feces of infected fleas, 438.
  virus, multiplication in oriental rat flea, 577.
Tyrannidae of New Jersey, N.J. 49.
Tyrophagus putrescentiae, notes, 150.
Udder infections, papers on, 313.
Ufens new species, description, 443.
Ultra-violet—
  and infra-red radiation, sources, 90.

Ultra-violet—Continued.
glass, antirachitic efficiency for winter sunlight of Chicago, 490.
glass, experiments, 386.
irradiation—
effect on milk production, 175.
of foods, patent grants dealing with, 491.
of plants to, effect on chlorophyll formation, 20.
of preschool children, effect, 780.
light, effect on growth and respiration of pea seeds, 387.
light, effect on vitamin A of butter, Ind. 631.
light, value for pigs, La. 295.
radiation for rickets, quantity relation to area of skin exposed, 630.
radiations, injurious effects on plants, 386.
Undulant fever, relation to Brucella infection in cattle and hogs, 312, 741.
United States Department of Agriculture—
Bureau of Agricultural Economics, *see* Bureau of Agricultural Economics.
Bureau of Home Economics, *see* Bureau of Home Economics.
Bureau of Public Roads, *see* Bureau of Public Roads.
Office of Experiment Stations, *see* Office of Experiment Stations.
Office of Farm Management, *see* Office of Farm Management.
Uranium oxide radiation, effect on olive plantlets, 512.
Urediuales, index and host index, 539.
Uric acid in avian excrement, determination, 8.
Urine—
of pregnant cows, effect on immature female guinea pigs, 233.
of pregnant women, ineffectiveness in hypophysectomized animals, 233.
reaction, effect of ingestion of plums and prunes, Wis. 769.
Uronic acids in humus, origin, 16.
Uspulun—
action on seed, 44.
toxic and tolerated dosage for seeds, 539.
Ustilaginales attacking Andropogon, monographic studies, 702.
Ustilago—
spp., physiologic races, 139.
striaeformis, reaction of timothy strains to, 697.
zeae—*see also* *host plants*.
multisporidial and monosporidial cultures, pathogenicity, 544.
mutation in, 612.
physiology and cytology, 544.
Utah Station, summary of publications, 782.
Uterus, studies, 121.
Vacuum sweepers, types, dirt-lifting efficiency and wear on carpets, 493.
Vaginal smear of ewes, cyclic changes, 232.
Valonia, direct current resistance, 372.
Valota saccharata, growth and germination, N.Mex. 29.
Valsa japonica and *Leucostoma leucostoma*, comparison, 145.
Van Rensselaer, Martha, home economics pioneer, editorial, 97.
Vaseline, effect on growth of molds, 698.
Vedalia beetle in Arizona, 423.
Vegetable—
diseases and control, N.J. 536.
diseases in Bristol Province, 544.
diseases of greenhouse, control, Mass. 399.
gardening, *see* Gardens.
oils, *see* Oils.
proteins, *see* Proteins.
seeds, quality on sale in New York, N.Y.State 130.
weevil, control, Calif. 559.
Vegetables—
California, composition and time for cooking, 770.
car-lot movements, Tex. 757.
carotenoid content, relation to light, 245.
culture, Nebr. 524; U.S.D.A. 35.
culture, treatise, 36.
damage during shipment, causes, Ill. 765.
fertilizer experiments, Fla. 523; Ohio 524; R.I. 244.
fresh and canned, vitamins in, 88.
fresh, cost of production at home and abroad, 335.
growth in sand cultures, N.J. 524.
insects affecting, *see* Garden insects.
iron in, U.S.D.A. 85.
market diseases, U.S.D.A. 270, 405.
marketing, analysis of job, 768.
of Dutch East Indies, 246.
of New York, N.Y.State 525.
paper mulch experiments, 246; R.I. 233, 244.
pests, 286.
preservation by quick freezing, 96.
soil acidity studies, N.Y.Cornell 15.
standard descriptions, 131.
storage tests, Ohio 524.
variety tests, Conn.State 523; Mass. 386; Ohio 524; Tex. 674.
vitamin $B(B_1)$ in, 634.
vitamin sources, 629.
Velvetbean caterpillar, control, Fla. 559.
Ventilation—
and heating of sweetpotato storage houses, 330.
electric, for dairy stables, 330.
system, barn, efficiency, Iowa 462.
Venturia—
chlorospora on willow, 703.
inaequalis in Maryland, discharge of ascospores, 275.
pyrina in Western Australia, 413.
pyrina, spraying tests, 414.

Vermont University, notes, 784.
Verticillium—
alboatrum, notes, 547.
alboatrum on cotton, description, U.S.D.A. 44.
tubercularioides on *Citrus malta*, 46.
Vespa maculata, population of nest, 581.
Vetch—
and peas sown with Kanota oats for hay, Calif. 516.
breeding, Calif. 516.
green manure, decomposition, relation to surrounding soil, 112.
new Botrytis in, 410.
timber milk, effect on sheep, Wyo. 70.
variety tests, Mass. 378.
Vetches, poisonous, Wyo. 738.
Veterinarians, agglutinins in blood of, 596.
Veterinary—*see also* Animal diseases.
medicine, preventive, and animal hygiene, treatise, 310.
obstetrics and zootechnics, treatise, 449.
Vibrio foetus, cause of abortion in South Africa, 70.
Vibrio septicus, notes. 455.
Vibrion septique and *Bacillus chauvaei*, bivalent vaccine against, 70.
Vinegar, making from citrus and blackberries, Fla. 620.
Vines—
climbing, of South Dakota, S.Dak. 533.
injured by frost, physiological derangements, 117.
Violet root rot in central Texas, Tex. 556.
Virgin Islands, scientific survey, 573.
Virgin Islands Station, report, 638.
Virginia Truck Station, notes, 192.
Virus diseases, studies, 537.
Viruses, physicochemical studies, Ind. 539.
Viscolizer, operation, ammeter and pressure gauge comparisons in, S.Dak. 79.
Vitamin A—
and antimony chloride reaction, 501.
and carotene, 200, 482, 501, 630, 646.
antimony trichloride test, interpretation of color match, 646.
characterization, biological experiments, 631.
characterization, spectroscopic evidence, 501.
containing substances, oxidation capacity, 482.
deficiency, effect on blood clotting mechanism, 486.
deficiency, effect on intestinal flora and pH value, 483.
deficiency, effect on intestinal permeability to bacteria, 483.
deficiency, rôle in cutaneous lesions in man, 482.
deficient diets, effect, Calif. 588.
free casein, preparation, new technic, 647.
in alfalfa hay, effect of artificial drying, 89.
Vitamin A—Continued.
in annatto, 481.
in apricots, 776.
in butter, effect of ultra-violet light, Ind. 631.
in cod-liver oil, determination, 200.
in figs, 776.
in fish meals, 589.
in halibut liver oils, 777.
in milk, 159; Nebr. 594.
in mushrooms, 629.
in pecans, 777.
in salmon oil, 481.
in spinach varieties, 630.
in sweetpotatoes, Mo. 480.
in yellow corn, Ind. 589.
in yellow corn exposed to air, Ind. 589.
in yellow plant pigments, Fla. 619.
international standards for, 776.
requirements of chicks, N.H. 592.
reserves of rats, effect on vitamin B (B_1) deficiency, 188.
summary, 769.
tests, specificity in, 341.
Vitamin, antineuritic, *see* Vitamin B (B_1).
Vitamin B (B_1)—
assay, concentration and solubility, 502.
chemical nature, 102.
concentration, 647, 779.
crystallized, preparation, 101, 102.
crystals, properties and structures, 502.
deficiency and lipemia, 486.
deficiency, biochemical lesions in, 344.
deficiency, blood sugar level in, 635.
effect on growth, 484.
effect on lactation, 484.
for treatment of anemia, 485.
in boiled milk, 779.
in diet of children, value, 484.
in fruits and vegetables, 634.
in fruits, distribution, 632.
in liver and stomach preparations, 187.
in milk, 159.
in peanuts, distribution, 778.
in pinto beans, N.Mex. 86.
in pork and lean beef, effect of cooking and canning, N.Dak. 778.
in rice bran bread, Hawaii 473.
in root vegetables, 343.
in spinach varieties, 630.
in vitro effect, 634.
in wheat bran, 483.
international standards for, 776.
origin, as result of coprophagy and refection, 632.
physiological function, 344.
removal of impurities, 503.
sparing action of fat on, 778.
studies, use of mice as test animals, 343.
Vitamin B_2, *see* Vitamin G.
Vitamin B complex—
constituents, 483.
deficiency, effect on blood clotting mechanism, 486.
deficiency, effect on intestinal flora and pH value, 483.

Vitamin B complex—Continued.
- deficiency in rats, effect on vitamin A reserve, 188.
- *effect on growth*, 484.
- effect on resistance of rats to enteritidis, 778.
- in bread, 483.
- in milk, 159.
- in milk, effect of rations, Ohio 65.
- in peanuts, distribution, 778.
- partial depletion, effect on learning ability in rats, 188.
- *requirement of animals*, 633.
- sources, Mo. 480.
- studies, Ohio 88.
- trends in current research, 769.

Vitamin C—
- chemical identification, 650.
- chemical nature, 649.
- deficiency, effect on blood, 486.
- determination, 189.
- in apples, Mass. 473.
- in apricots, 776.
- in canned fruits, Mass. 473.
- in carrots preserved by canning and cold storage, S.Dak. 88.
- in figs. 776.
- in grapefruit, 344.
- in Hawaiian oranges, Hawaii 473.
- in mushrooms, 629.
- in oranges, 344.
- in spinach varieties, 630.
- isolation and identification, 650.
- narcotine as precursor, 648.

Vitamin D—
- action, nature, 345.
- and related compounds, crystal structures, 201.
- crystalline, 201, 503.
- deficiency, effect on blood, 486.
- deficiency, effect on growth of skeleton and internal organs, 729.
- depression of intestinal reduction by, Iowa 473.
- *determination, methods*, 636.
- effect on bone tuberculosis in children, 88.
- *in fruits and vegetables*, 629.
- in irradiated milk, 490.
- in milk, effect of exposure to sunshine, S.Dak. 65.
- in milk, effect of irradiated ergosterol, Ohio 65, 448.
- in mushrooms, 630.
- in preserved eggs, 490.
- in salmon oil, 481.
- in sardine oil, Calif. 588.
- in shrimp meal and sun-dried shrimp, La. 341.
- international standards for, 776.
- optical rotation, 108.
- preparation and properties, 201.
- standardization by line test, 345.
- supplement for calves deprived of legume hay, Wis. 731.

Vitamin D_2 and Calciferol, identity, 201.

Vitamin E deficiency—
- and intrauterine changes in rats, 485.
- effect on lactation, 485.

Vitamin F, *see* Vitamin B (B_1)

Vitamin G (B_2)—
- concentration, 779.
- in fruits, distribution, 632.
- in liver and stomach preparations, 187.
- in milk, 159.
- in mixed human milk, 624.
- *in mushrooms*, 629.
- in peanuts, distribution, 778.
- in potatoes, La. 341.
- in protein-free milk, factors affecting, Mich. 359.
- in root vegetables, 343.
- origin as result of coprophagy and refection, 632.
- rôle in erythrocyte formation, 635.
- sources, stability and chemistry, 188.

Vitamin standards, international conference, report, 480.

Vitamin supplements for chicks, Mo. 445.

Vitamins—
- action of radioactive substances on, 646.
- association with nutritional conditions in plants, Iowa 385.
- deficiency—*see also* Avitaminosis.
  - tissue reactions in, 189.
- effect on maintenance and survival periods in rats on different diets, 185.
- in canned foods, 480.
- in canned v. fresh vegetables, 88.
- in Chinese cabbage, Hawaii 473.
- in field-cured and artificially-cured hay, Nebr. 594.
- in foods, factors affecting, Pa. 185.
- in January and June eggs, Mo. 480.
- international, standards, 776.
- isolation, 200.
- photochemistry, 500, 501.
- physiology of, 633.
- studies, Mo. 480; Wis. 776.

Vivipary in corn, 225.

Vocational agriculture, teaching methods, treatise, 336.

Volutella pachysandrae n.sp., description, 402.

Walls, masonry, moisture penetration, 464.

Walnut—
- black, tolerance to insecticides, 566.
- *caterpillar, notes*, 563.
- crown rot, relation to Phytophthora, 279.
- dehydraters, *thermal* efficiency and cost, Calif. 611.
- diseases, studies, Calif. 535.
- husk fly, control, 423; *Calif.* 559.

Walnuts—
- development of embroyo and endosperm, 685.
- insects and pests affecting, 565.
- studies, Calif. 526.

Washington College, notes, 495.

Washington College Station, notes, 192, 495.
Washington, George, the master farmer, Mich. 494.
Wasps, mud, of tobacco leaves, 150.
Wasps, witchery of, 581.
Water—
- bound, in plant tissue, determination, 504.
- bound, notes, 559.
- capillary rise through soils, Hawaii 366.
- colored natural, decolorization, 360.
- consumption of cattle, relation to method of watering, U.S.D.A. 65.
- cress, iron in, U.S.D.A. 86.
- cress, vitamin B (B_1) in, 634.
- flow in soils, coordination of research, 322, 323.
- flow through fine screens, head loss in, 606.
- forms and functions in soil, 219.
- heating by solar energy, 608.
- metabolism, aspects, 769.
- rain, *see* Rain.
- requirements of grasses, 234.
- soft, for the home, Ill. 751.
- supplies, N.J. 605.
- supplies and sewage disposal, report, N.J. 751.
- supply—
  - handbook, 172.
  - insufficient, response of plants to, 116.
  - of Hawaii 751.
  - of Pacific slope basins in Oregon and lower Columbia River Basin, 76.
  - of United States, 172, 173.
  - of United States, 1929–1930, 462, 605.
- survey of Cimarron Co., Okla.Panhandle 462.
- vapor absorption of soils, effect of soil salinity, Calif. 504.

Waterfowl protection and increase, treatise, 281.
Watermelon—
- diseases, control, Fla. 535.
- wilt in Iowa, 551.
- wilt resistant varieties, Iowa 143; Tex. 690.

Watermelons—
- culture, Ga.Coastal Plain 387; Miss. 35.
- experiments with, N.Mex. 35.
- improvement, Calif. 525.
- pruning, Miss. 35.
- variety tests, Miss. 35.

Waxes as carriers of insecticides, 708.
Weather—*see also* Meteorological observations *and* Meteorology.
- changes, relation to polar-equatorial circulation, U.S.D.A. 10.
- conditions, 1930, Ohio 12.
- of 1931 in United States, U.S.D.A. 11.

Webworm, fall, notes, 563.
Webworms, sod, control, 435.
Weed seeds from irrigation water, screening, head loss in, 606.
Weeds—
- control, N.Dak. 667; Tex. 668; Wis. 669; Wyo. 31.
  - by ammonium thiocyanate, 130.
  - by chlorates, 243; Ohio 29.
  - by chlorates, improving efficiency, Idaho 243.
  - in pastures, N.J. 517.
  - in soybeans, Ohio 75.
  - machinery for, Can. 467.
- destruction, new procedure, 610.
- eradication, 234.
- eradication by machine applied chemicals, 329.
- in different regions of Russia, 384.
- lawn, effect of soil reactions, Ohio 29.
- losses from, estimation, 123.

Weevil studies, results from brood chambers, 285.
Welding, American Bureau of, Structural Steel Welding Committee, report, 78.
Wells—
- *Armillaria mellea* in, 280.
- disinfection with chlorine gas, 331.
- economic design, 322.

Whale meal, feeding value, 589.
Wheat—
- amino acid deficiencies, for growth in rats, 627.
- and emmer cross, morphologic characters and rust resistance, relation, 140.
- and emmer hybrids, partly fertile, 664.
- and rye, continuous, with and without a legume green manure, NJ. 507.
- and rye hybrid, description, 513.
- and rye hybrids, improvement in Russia, 234.
- autumn-sown, variety tests, 31.
- awn color, inheritance, 229.
- baking quality, 31.
- behavior in grinding, 177.
- bran, vitamin B (B_1) in, 483.
- breeding, Iowa 378; Mo. 378; N.Dak. 667; Nebr. 517; Tex. 668.
- breeding, predicting value of a cross from F_2 analysis, 230.
- browning root rot, 139.
- bunt, *see* Wheat smut, stinking.
- clipping, effects, Ohio, 29.
- composition, effect of plant nutrition, 522.
- cross, inheritance in, 230.
- crosses between fourteen- and seven-chromosome species, cytology and genetics, 513.
- crosses, failure of hybrid germ cells. 229.
- crosses, inheritance of bunt resistance, 140.
- culture, ecological basis, 190.
- culture experiments, Iowa 378; N.Mex. 29; Ohio 517; Tex. 668; Wyo. 31.

Wheat—Continued.
disease resistant varieties, N.Dak. 695.
diseases, notes, 537.
dwarfing in, inheritance, Utah 663.
feeding value, Ind. 588; Mo. 445; Ohio 58; Tex. 723.
fertilizer experiments, 123; Fla. 516; Nebr. 517; Ohio 30; Tex. 668.
flag smut, reaction of varieties to, 692.
flag smut resistant varieties, 405.
flour, see Flour.
foot rot, microorganisms causing, 268.
for hay and seed, variety tests, Md. 517.
frosted, milling and baking quality, 242.
furrow grain drill v. ordinary drill for, Ohio 75.
Garnet, milling and baking qualities, overseas tests, 242.
germ and yeast in cereal mixture, effect on children, 484.
grain disease, notes, 268.
grass, tests, N.Mex. 29.
growth, effect of nitrate nitrogen concentrations of nutrient solutions, 661.
heads, empty, causes, 404.
hogging down, Ohio 58.
improvement, N.J. 517.
inheritance of spike density, peculiar, 229.
insects, survey, Iowa 424.
irrigation requirements, Can. 463.
leaf rust, physiologic specialization in, U.S.D.A. 692.
loose smut, rôle of humidity in, 692.
Marquis, baking quality, effect of storage at various moisture contents, 242.
morphological study, 240.
moth pest, 714.
natural crossing in, 231.
prices, cycles in, 182.
protein in, weight, and smut susceptibility, N.Dak. 667.
protein tests for, U.S.D.A. 84.
quality, effects of soil type, Ohio 29.
quality, test, Ind. 517.
residue, effect on crop yields, 31.
resistance to frost and drought, N.Dak. 667.
rotation experiments, Nebr. 517.
seed-borne diseases, control, Iowa 399.
seeding and seedbed preparation, Ohio 521.
seedling blight, predisposition to, factors affecting, 541.
situation, world, 1930–31, 182.
smut—see also Cereal smuts.
notes, 268.
smut, stinking—
control, relation to removal of smut balls, 541.
inheritance of resistance to, 140; Calif. 535.

Wheat—Continued.
smut, stinking—continued.
liquid and dust disinfectants for, 541.
notes, N.Dak. 690.
prevention with copper dusts, 404.
varietal resistance tests, 404.
species, systematics, genetics, and cytology, 673.
spot prices, 1879–1930, U.S.D.A. 85.
spring—
of western Canada, milling and baking quality, 241.
variety tests, N.Mex. 29; Nebr. 517.
yields, Ind. 667.
starch, heat of hydration 357.
stem rust—see also Cereal rust and Rust.
in Mississippi, relation to weather, 541.
resistant varieties, 405.
strains from interspecific crosses, variability, 663.
straw applications to heavy soils, value, 246.
stripe rust, breeding for immunity to, 693.
susceptibility to *Chlorops taeniopus*, 284.
take-all problem, soil phases, 692.
v. corn for milk production, Ohio 65.
v. wheat and tankage for fattening pigs, Okla.Panhandle 301.
value for dairy cows, N.Dak. 731.
varietal mixture, effect on milling and baking quality, 129.
varieties—
home-grown, in England, quality, 31.
improved, registration, 130.
purification, Calif. 516.
resistant to Hessian fly, qualities, Mo. 424.
variety tests, Iowa 378; Mo. 378; N.Dak. 667; Ohio 517; Tex. 668; U.S.D.A. 28; Wyo. 30.
winter—
cold resistance in, 508.
in rotation, cause of failure, 17.
response to top-dressing with nitrogen, Nebr. 505.
sowing sweetclover in, Ohio 240.
uptake of nutritive material by, 661.
v. spring, comparison, Ohio 30.
varieties and strains, Kans. 240; N.J. 123.
varieties for Ohio soils, Ohio 521.
varieties, yields, Ind. 667.
variety tests, N.Mex. 29; Nebr. 517.
winter resistance, Iowa 378.
yellow rust, varietal behavior toward, 692.
yield and cost per acre, Md. 613.

Wheat—Continued.
- yields at Woburn, 123.
- yields, effect of drought, Ohio 30.
- yields, relation to weather, 123.

Wheatgrass, crested, description, U.S.D.A. 518.
White ants, *see* Termites.
White flies—
- new species of Formosa, 432.
- of India, 151.

White fly—
- citrus, in California, 423.
- citrus, progress, 705.
- greenhouse, life history, 432.
- sugarcane, notes, 562.

White grubs—
- control with rotary plow, 577.
- injury to bluegrass, effect of environment, 292.
- natural enemies, 562.
- new habits, Wis. 706.

White pine—
- bark aphid, control, 566.
- blister rust—
  - biological control, 48.
  - cankers, *Dasyscypha agassizii* on, 418.
  - need for reeradication work, Conn. State 535.
- new moth affecting, 435.
- seedling analysis in field, inaccuracy, 534.
- seedlings, mycorrhizae on roots, 373.
- weevil, summary, U.S.D.A. 439.

Willow—
- scab fungus, biological studies, 703.
- weevil, control, Calif. 559.

Willows—
- insects on, control, 284.
- new fungus on, Conn.State 535.

Wilson, E. H., biographical sketch, 262.
Wind and central station power in Germany, 467.
Wind, farm building losses in Iowa due to, 612.
Windbreaks, *see* Trees, windbreak.
Winter fat, growth and germination, N.Mex. 29.
Winthemia, American species, revison, Tex. 576.
Wire rope, bending, effects, 78.
Wireworms, notes, N.J. 561.
Wisconsin Station, report, 782.
Woburn farm, operations, 124.
Wohlfahrtia vigil, notes, 596.
Women—
- elderly, basal heat production, 771.
- over thirty-five, metabolism, 87.
- training for country life, 767.

Wood—*see also* Lumber *and* Timber.
- borers, notes, 579.
- cellulose relation to lignin, 646.
- moisture content and strength properties, U.S.D.A. 774.
- sap stains, prevention, 419.
- substitute for beehives, 720.

Woodlands, improvement, 41
Woodlots, farm, management for profit, Ill. 584; Ind. 583.
Woods of—
- North American Abies, identification, 137.
- Philippines, nail-holding power, 608.

Wool—
- and mohair marketing, evening schools on, organization, 768.
- fibers, medullated and nonmedullated, breaking stress and textile strength, Calif. 588.
- fineness, relation to age of animal, Tex. 723.
- grades, effect on physical properties of flannel, S.Dak. 94.
- growth in sheep, effect of gland transplantation, 27.
- lumpy, of Merino sheep, cause and transmission, 70.
- production, effect of plane of nutrition, La. 295.
- production, feeding for, 726.
- quality, 98.
- Texas, grades and shrinkages, Tex. 723.

Wyoming Station, report, 94.
Xenopsylla cheopis, *see* Rat, flea, oriental.
X-ray treatment—
- genetic after-effects, 232.
- of potatoes, effect, N.J. 517.

X-rays—
- cytological action, 512.
- dosage to roots of *Allium cepa*, 512.
- effect on chick embryo, 28.

Xylaria mali, notes, 410.
Xyleborus germanus, notes, 559.
Xyleutes ceramicus, notes, 562.
Xylocopa species, life history, 441.
Xylonomus spp., biology, 584.
Yak and zebu hybrids, 377.
Yams, breeding, P.R. 517.
Yautias, fertilizer experiments, P.R. 517.
Yeast—
- foods, analyses, 365.
- growth promoting value for chicks, 729.
- irradiated, antirachitic value, 89.
- nutrition factors other than vitamins, 186.
- supplements, effect on corn and soybean rations, 295.

Yeasts in butter, determination methods, 162.
Yellow fever mosquito—
- and fowl pest, transmission, 171.
- transportation by airplanes, 437.
- winter breeding and activity at New Orleans, 55.

Youngberries, cold storage studies, Fla 523.
Zadiprion rohweri n.sp., description, 441.
Zatropis incertus, notes, Colo. 719.
Zebu and yak hybrids, 377.
Zeolites, base-exchange reactions, equilibria, 14.

Zeuzera pyrina, see Leopard moth.
Zinc—
atmospheric corrosion, 464.
effect on citrus, Calif. 278.
sulfate with hydrated lime as peach spray, 700.
Zinnias, fertilizer experiments, Conn.State 523.
Zoology, agricultural and forest, fundamentals and laws, treatise, 419.
Zophodia grossulariae, see Gooseberry fruit worm.